RAILROAD GAZETTE

SATURDAY, JULY 31, 1875.

Contributions.

SAFETY-VALVES.

BY RICHARD H. BUEL.

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The position of the center of gravity of any lever can also be found by calculation, and the manner of doing it will now be explained. It may be well to give, in the first place, a few definitions and illustrations.

The resultant of two or more forces is a single force, whose action is equal to the combined effect of the several forces, which are called components.

The moment of a force with reference to any point is the product arising from multiplying the intensity of the force by the distance of the point from the force measured in a straight line drawn from the point perpendicular to the direction of the force. This distance is called the arm of the force.

When any number of forces act in the same plane, the moment of the resultant is equal to the sum of the moments of those forces which tend to turn a body in the same direction that the resultant does, diminished by the sum of the moments of those forces that tend to turn the body in the opposite direction. This is generally more concisely expressed by saying that the moment of the resultant is equal to the algebraic sum of the moments of the components. In Fig. 9 an illustration

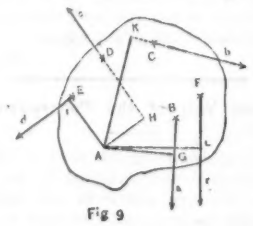


Fig 9

of this principal is given. Four forces in the same plane, represented by the darts *a*, *b*, *c*, *d*, are acting at the points *B*, *C*, *D*, *E* of a body which is secured so that it can only turn around the point *A*, and *r* is a single force which will produce the same effect as these four forces, or it is the resultant of *a*, *b*, *c*, *d*. The perpendicular lines drawn from the point *A* to the directions of the several forces represent the arms of these forces. An inspection of the figure will show that the forces *a*, *b* tend to turn the body in the same direction that the resultant does, while the forces *c*, *d* tend to turn it in the opposite direction. The analytical statement of the principle given above will, then, be:

$$r \times A\,L = a \times A\,G + b \times A\,K - (c \times A\,H + d \times A\,I)$$

From this equation it appears that if all but one of the parts in any example of this kind are known, the other can readily be ascertained. Suppose, for instance, that the intensities of all the forces are known, and all the arms, except that of the resultant, as follows:

a = 108 pounds		$A\,G$ = 75 inches.	
b = 114	"	$A\,K$ = 170	"
c = 72	"	$A\,H$ = 65	"
d = 81	"	$A\,I$ = 75	"
r = 150	"		

From these values the following equation can be formed:

$$150 \times A\,L = 8{,}100 + 19{,}380 - (4{,}680 + 6{,}075)$$
$$= 27{,}480 - 10{,}755$$
$$= 16{,}725$$

and $A\,L = 16{,}725 \div 150 = 111\frac{1}{2}$ inches.

The lever of a safety-valve is acted upon at every point by a force which is the weight of the particle at that point, and the resultant of all these forces is their sum, or the weight of the whole lever, and the point at which it acts is the centre of gravity of the lever. This point, then, can be found with sufficient accuracy—by supposing that the lever is divided up into such small parts that the centre of gravity of each can be estimated at its geometrical centre, without serious error, and its weight calculated as if its faces were trapezoids—so that an equation can be formed with the movements of these forces. In Fig. 8 the lever is divided into 20 parts, and the weight of each is calculated, being shown by the darts on the elevation.

The moments of the force are referred to the point *E*, and the calculation by which the center of gravity is found, is given below:

Moment of weight of part	1— 2,	—0.98 ×	0.5 =	0.49
" " "	2— 3,	—1.95 ×	1.5 =	2.93
" " "	3— 4,	—2.09 ×	2.5 =	5.22
" " "	4— 5,	—1.63 ×	3.5 =	5.71
" " "	5— 6,	—1.33 ×	4.5 =	5.98
" " "	6— 7,	—1.34 ×	5.5 =	7.37
" " "	7— 8,	—1.36 ×	6.5 =	8.84
" " "	8— 9,	—1.35 ×	7.5 =	10.13
" " "	9—10,	—1.27 ×	8.5 =	10.79
" " "	10—11,	—1.14 ×	9.5 =	10.83
" " "	11—12,	—1.03 ×	10.5 =	10.82
" " "	12—13,	—0.87 ×	11.5 =	10.00
" " "	13—14,	—0.76 ×	12.5 =	9.50
" " "	14—15,	—0.63 ×	13.5 =	8.51
" " "	15—16,	—0.55 ×	14.5 =	7.97
" " "	16—17,	—0.49 ×	15.5 =	7.60
" " "	17—18,	—0.43 ×	16.5 =	7.09
" " "	18—19,	—0.36 ×	17.5 =	6.30
" " "	19—20,	—0.40 ×	18.5 =	7.40
" " "	20—21,	—0.51 ×	19.5 =	9.95
				153.43

Calling *E H* the distance from the end of the lever to the center of gravity, and recollecting that the resultant is equal to the weight of the lever,

$$20.47 \times E\,H = 153.43;$$
Whence, $E\,H = 7\frac{1}{2}$ inches.

This mode of determining the center of gravity of a lever is quite tedious, if the parts are taken small enough to secure great accuracy, but it is useful in case the plan by trial is impossible.

The condition that a safety-valve shall rise at a given pressure of steam requires, as has already been stated, that the forces tending to hold the valve down shall be just balanced by the tendency of the opposing forces to raise it. In Fig. 1 there are three forces holding the valve down—the weight of the ball, *W*, the weight of the lever, *L*, and the weight of the valve, *V*, and these must be balanced by the pressure of the steam, *P*. When any number of forces balance each other, the sum of the moments of the forces which act in one direction is equal to the sum of the moments of the forces which act in the other direction. Hence the following equation will represent the action of the forces when the valve is just balanced:

$$P \times p = W \times w + L \times l + V \times p.$$

If any seven of the quantities in this equation are known, the other can be determined. The equation can, however, be changed a little, so as to be more generally useful:

Let S = pressure of steam in pounds per square inch, D = diameter of valve in inches; then,

$$P = 0.7854 \times D^2 \times S,$$

and the equation becomes:

$$0.7854 \times D^2 \times S \times p = W \times w + L \times l + V \times p.$$

For the ordinary cases that arise in practice the equation will take the following forms:

1st. *To find the pressure per square inch at which a given valve will open:*

$$S = \frac{W \times w + L \times C + V \times p}{0.7854 \times D^2 \times p}$$

2d. *To find where to place weight on a given safety valve, so that it shall open at a given pressure per square inch:*

$$w = \frac{0.7854 \times D^2 \times P - L \times l - V \times p}{W}$$

3d. *To find what diameter a safety valve must have, all the other parts being known, to open at a given steam pressure:*

$$D = \sqrt{\frac{W \times w + L \times l + V \times p}{0.7854 \times S \times p}}$$

As many who are familiar with arithmetic but do not understand algebraic expressions may like to use these rules, they are given below in words:

1st. *To find the pressure per square inch at which a given valve will open.*

Measure the following distances horizontally from the fulcrum to:

1. The centre of the valve stem.
2. The centre of the weight.
3. The centre of gravity of the lever, or the point on which it will balance if placed upon a knife-edge.

Measure the diameter of the valve, and determine its area, either from a table or by multiplying the square of the diameter by 0.7854.

Find the weight of:

1. The valve.
2. The lever.
3. The ball.

Multiply—

(1). The weight of the ball by its horizontal distance from the fulcrum.

(2). The weight of the lever by its horizontal distance from the fulcrum.

(3). The weight of the valve by its horizontal distance from the fulcrum.

(4). The area of the valve by its horizontal distance from the fulcrum.

Add together the first three products and divide the sum by the fourth product.

Example.—A given safety-valve has a weight of 50 pounds 24 inches from the fulcrum, the lever weighs 6 pounds, and its center of gravity is 15 inches from the fulcrum; the weight of the valve is 2 pounds, and its center is 4 inches from the fulcrum. The diameter of the valve is 2 inches. At what pressure will the valve begin to rise?

Square of diameter	4
Multiply by	0.7854
Area of valve in square inches	3.1416

(1). 50 × 12 = 1,200
(2). 6 × 15 = 90
(3). 2 × 4 = 8
(4). 3.1416 × 4 = 12.5664

The sum of (1), (2) and (3) is 1,298, which divided by 12.5664 (the fourth product) is 103.03 = pressure in pounds per square inch at which the valve will open.

2. *To find where to place the weight on a safety-valve, so that it shall open at a given pressure of steam:*

Multiply—

(1). The weight of the lever by the horizontal distance of its center ot gravity from the fulcrum.

(2). The weight of the valve by its horizontal distance from the fulcrum.

(3.) The area of the valve by the pressure of steam in pounds per square inch, and by the horizontal distance of the valve from the fulcrum.

Add together the first two products, subtract their sum from the third product, and divide the difference by the weight of the ball.

Example.—The ball of a safety-valve weighs 100 pounds, the lever weighs 10 pounds, the valve weighs 2 pounds and has a diameter of 3 inches. The distance of the center of gravity of the lever from the fulcrum is 25 inches, and the distance of the center of the valve from the fulcrum is 5 inches. How far from the fulcrum must the valve be placed, in order that the lever may open at a pressure of 100 pounds?

Area of valve	7.07 square inches

(1). 10 × 25 = 250
(2). 2 × 5 = 10
(3). 7.07 × 100 = 707
707 × 5 = 3,535.

Adding together products (1) and (2) we have as their sum 260; subtracting this from 3,535, the third product, we have 3,275. Dividing this difference by 100, the weight of the ball, we have 32.75, or 32¾ inches as the distance from fulcrum to ball.

3d. *To find what diameter a safety-valve must have, the other parts being known, to open at a given steam pressure:*

Multiply,

(1). The weight of the ball by its horizontal distance from the fulcrum.

(2). The weight of the lever by the horizontal distance of its center of gravity from the fulcrum.

(3). The weight of the valve by the horizontal distance of its center from the fulcrum.

(4). The pressure of steam in pounds per square inch by the horizontal distance of the valve from the fulcrum, and by the number 0.7854.

Add together the first three products, divide their sum by the fourth product, and take the square root of the quotient.

Example.—Weight of ball, 60 pounds; lever, 7 pounds; valve, 3 pounds. Distances from fulcrum: ball, 30 inches; center of gravity of lever, 16 inches; center of valve, 3 inches. Pressure of steam, 70 pounds per square inch. What should be the diameter of the valve?

(1). 60×30=1,800
(2). 7×16= 112
(3). 3× 3= 9
(4). 70×3×0.7854=164.934

The sum of the first three products (1,800+112+9) is 1,921. Dividing this sum by 164.934 (the fourth product), we have 11.647 inches. The square root of this number is 3.41+ inches, which by the rule is the required diameter of the valve.

Instead of weights, springs are sometimes employed to hold down safety-valves. The calculations involving merely the condition that the valve shall open at a given pressure, are the same as those previously employed, except that the tension of the spring is to be substituted for the weight of the ball, this tension being first determined by experiment. Having ascertained the dimensions of a spring most suitable for a given case, it is easy to calculate the dimensions of a spring for any other case. Knowing, for instance, the cross-section of a spring adapted to one pressure on the valve, make a proportion, thus:

Cross section of given spring : Cross section of required spring :: Pressure on first valve : Pressure on second valve

The pitch of the second spring, or the distance from the centre of one coil to the centre of the next, is found by the following proportion:

Pitch of given spring : Pitch of required spring :: {Side of a square equal in area to section of first spring.} : {Side of a square equal in area to section of second spring.}

Example.—It is a common practice in proportioning the parts of direct-loaded spring safety-valves to use a spring of the following dimensions: for a valve 3 inches in diameter and 100 pounds steam pressure, a spring made of square steel, having a cross section of ¼ of a square inch, and a pitch of one inch, the side of a square equal in area to the cross-section being, of course, ⅜ inch. What should be the proportions of a similar spring for a valve 5 inches in diameter, and a steam pressure of 50 pounds per square inch?

Area of first valve	7.07 in.
Multiply by steam pressure	100
Total pressure on first valve	707
Area of second valve	19.64 in.
Multiply by steam pressure	50
Total pressure on second valve	982

To find cross section of required spring:

0.25 : Cross section of second spring :: 707 : 982

and by the rule for proportion, the product of the two extremes (0.25×982=245.5), divided by the third term (707), will give the second term. Now 245.5÷707=0.34724 in.= cross section of second spring. The square root of 0.34724, is 0.589+, and this is the side of a square equal in area to cross-section of second spring.

To find pitch of second spring:

1 : Pitch of second spring :: 0.5 : 0.589.

Here we solve the problem by multiplying 1 by 0.589 and dividing the product by 0.5, which gives 1.178 inches, which is the pitch of second spring.

[TO BE CONTINUED.]

An Effective Car-Wheel Record.

NEW YORK, July 19, 1875.

TO THE EDITOR OF THE RAILROAD GAZETTE:

The subject of car-wheel mileage and the means of arriving at an accurate knowledge of the distance a wheel runs, and the character of the service it performs, has been frequently discussed in your journal, and has been a matter of investigation by many of the large railway corporations. Views have been interchanged on this important matter, and it is surprising how meagre is the general information regarding it, and how few companies have even the most indifferent means of knowing whether they are buying poor wheels or good ones.

Guarantees of a certain mileage to be performed by their wheels are, of course, always agreed upon by manufacturers, but such guarantees, in nearly all cases, are mere nullities, for the plain reason that railway companies cannot tell whether or not the contract has been performed.

This is a question that ought to command the earnest attention of all practical railroad men. As the case now stands, they are decidedly under the control of the wheel makers. I do not wish to animadvert upon these gentlemen, who are probably as honorable as other classes of manufacturers, but I do say that where so much competition exists, and where good wheels and indifferent ones are *equally* appreciated by railroad companies, for the want of proper facilities for discriminating

between them, many makers are forced, in self-protection, to use materials which, under other circumstances, they would refrain from using.

A poor wheel is dear at any price. The cost of removing it from the car and from axle, the application of a new one to replace it, the delay and other incidental expenses, would alone more than cover the difference in price between it and the best wheel in the market. I say nothing of the loss in mileage or of its liability to cause an accident, possibly involving the loss of thousands of dollars and perhaps lives. Yet how many of these are purchased by railway companies in entire ignorance, unless perhaps their eyes are opened by a succession of accidents, entailing serious losses.

Many wheel-makers cannot afford to put the best material into their wheels in the face of this competition, and an evidence of it is that those manufactured at the present time do not compare at all favorably with those made years ago. Statistics are adduced from time to time showing an average of 30,000, 40,000 and even 50,000 miles for iron wheels (the character of the service is rarely stated, though it is palpable that a wheel will run very much further under a freight car than under a passenger express car), but I am fully convinced that there are very few makers who can safely guarantee the least of these averages under passenger cars. The reason of it is patent; not that suitable iron is unattainable or that they are improperly manufactured, but that good wheels will not command their proper price, and therefore the best material is seldom used.

It will be found that nearly all makers will furnish about the same guarantees, no matter how different in quality their wheels may be. Those who use poor material do this trusting to the inability of buyers to decide whether or not the contract has been complied with. In the case of one of the largest railway companies in America, guarantees are regularly required, yet never are the wheel-makers called upon to replace a wheel that fails to perform its mileage. Under such circumstances makers can afford to offer the highest guarantees and not be over particular as to the quality of the iron they use. The above is by no means an isolated case, but in all such the losses to these companies must be very great.

If, therefore, a system were adopted by the railway community generally, by which good wheels could be detected and separated from the chaff that fills the market, there would be a revulsion in the present competition, not so much in regard to price as to quality. As it is now, the latter is ignored so long as the first is obtained. Makers of good wheels would hail with delight such a system, the traveling public would feel more secure, and railways would be benefited to an enormous extent. And yet the attainment of such an object is very simple and by no means expensive.

To keep the mileage of all freight cars of a leading railroad company would undoubtedly be very expensive, owing to their large number, and almost impossible from the fact of their running over foreign roads, but there is no difficulty whatever in ascertaining the *accurate* mileage of locomotives and tenders, which do not leave their respective divisions, or of cars of passenger equipment which do not go beyond the termini of the road, and that, too, at but slight expense. The service under these is a sure test of wheels, on account of their weight and speed. Under freight cars it is much less severe, and a knowledge of it, consequently, is less valuable, though by the system which I propose to illustrate, an *accurate* record can easily be kept of freight car wheels, *on a time basis*, by which the mileage can be approximated pretty nearly. Statistics show, in the cases of noted makers, that on a guarantee of all wheels to serve one year, only about two-tenths of one per cent. of those applied to freight cars fail to perform the contract.

As no wheels would be purchased specially for freight service, makers would not be enlightened as to what purpose they are intended to be put, and it would be unsafe on their part to furnish indifferent wheels, trusting to their being used for freight traffic. Moreover, all large railway companies have always on hand plenty of good second-hand wheels that can be used for their own freight cars—those that have been removed from passenger cars and tenders, on account of slight defects which would render it injudicious to continue their use under heavy cars and at rapid speed; but which are, nevertheless, excellent for lighter service. And it would be well if railway companies were to profit by this suggestion, instead of constantly buying new wheels for freight cars, while they have these in piles at every shop.

It will readily be admitted by all who have investigated the matter, that there is little difficulty or expense in obtaining, by proper reports from engineers and conductors, the precise mileage of locomotives, tenders, passenger, baggage, mail and express cars. The question then arises, how to keep a record of the *wheels*, by an inexpensive method, so that this mileage may be applied with *accuracy* to them, and *not approximated or guessed at*, as is generally the custom.

There are many ways in use by railway companies, but nearly all of them are next to useless.

Some have a plan of marking in white lead on the wheel the date it is applied to a car and the date of its removal. This is extremely unreliable; the marks become obliterated, and if the wheel is removed and re-applied several times, as constantly happens, the entire wheel is covered with illegible dates. Others have a way of stamping the dates on with a small stencil. The wheels become so begrimed and covered with oil, cinders and dirt as to render it necessary to soak them in hot water and scrape them to make the small figures readable; this is impracticable. But the chief objection to the above is the unreliability of the reports from the car and engine shops of these dates, when taken from the wheels, which would nevertheless have to be accepted as correct. To insure having a reliable record, it is indispensable that all shop reports on matters pertaining to wheels be reduced to the very simplest form, and so sytematized that any incorrectness can at once be detected. It is useless to expect from the low-salaried employees that are detailed for this duty statements or reports in any elaborate shape whatever. The information to be gotten from them must be so simplified and divested of intricacy as to enable any man of ordinary sense to give it. Accuracy is of course required, but the system must be such that any failure in this regard can be rectified. It will be ascertained, by practical working, that, in spite of all precautions, a large item of the labor of keeping a record is in correcting inaccuracies from the shops.

It is a surprising fact that some large railway companies, who object, for fear of the expense, to adopting a proper wheel record system, have the *most expensive* and laborious modes, for the reason that the reports required by the superintendents are so numerous and intricate that competent clerks a fair salaries are needed at each shop, and even then the results are wholly unsatisfactory.

The duties of reporting all transactions in connection with wheels can be rendered so simple as to occupy only a fraction of the time of a clerk at each shop, unless the work is extremely heavy. The keeping of the wheel record, based on these reports, should be attended to by capable clerks at the general office. To record the changes in 150,000 guaranteed wheels would seem almost impossible at any reasonable expense, yet one would be astonished at the small clerical force needed to accomplish it, while the saving to a company of enforcing guarantees, and the value of the information obtained, would pay the entire expense ten times over.

The principle of the system is exceedingly simple, and, considering the magnitude of the task, the working of it is wonderfully easy. The perfect knowledge obtained by it of the exact value of every wheel purchased, by which no doubt can exist as to who make the best, and the saving of thousands of dollars by an enforcement of the wheel contracts, render it a most valuable adjunct to the motive power department.

Almost the *precise* number of *revolutions* of every engine and passenger car wheel can be accurately given, and the *exact* time (in months and days) of every freight car wheel, no matter when it was purchased, how long it has remained idle, or how often it has been applied and removed. A perfect history of it is shown at a glance. If wheels are split or weakened in pressing on axle, or become "loose," through the incompetency of the wheel fitters, the monthly transcripts from this record show who are the delinquents, though the wheels may be removed at points distant from where the work was done. If cars are burnt up or destroyed in wreck, and there is no possibility of identifying them by inspection, it is only necessary to send the numbers of the wheels to the general office, and the record will afford full information. It is particularly useful in detecting cars with duplicate numbers.

If this record were generally adopted, the accuracy of its statistics (nothing being conjectured or approximated excepting the mileage of freight cars, which would be too expensive to keep) would undoubtedly secure a higher standard of perfection in the manufacture of wheels. A very few months would expose those of inferior quality. Makers of such would be driven from their occupation, as, by being required to exchange their defective wheels until the guaranteed mileage was completed, they would not only reap no profit, but a heavy loss.

In one of your editorials you gave a good illustration of what the loss must be to railroad companies by having no good wheel record system, and you cited the case of a leading railroad which removed in a year 17,572 wheels as unfit for further use. These at $18 each, guaranteed for 50,000 miles, would cost $316,296. If, however, they averaged only 40,000 miles, the loss to that company would be $63,259, and if they averaged only 30,000 miles, the loss would be $126,518. And this latter average is pretty nearly correct. Take, for example, the report of Mr. Chamberlain, of the Boston & Albany Railroad, a few weeks ago, wherein he states the average of 2,204 wheels to be 33,815 miles, many of which, no doubt, were freight car wheels, and, of course, guaranteed for more than 50,000 miles. Can any railroad company stand such a loss? And will they close their eyes to it?

The system I have referred to requires that all wheels purchased shall have the *name of the maker*, *date made* and *number* cast upon them in large block letters and figures, so that with little scraping or trouble they may be easily discerned; that each maker should number his wheels, consecutively, from No. 1 upwards (filling up blanks and avoiding duplicates), until they reach a point where it becomes necessary to commence a new series.

No confusion ever arises between the series, as the *date made*, cast on each wheel, prevents it. The reports of transactions in wheels at each shop are embraced in several small books (properly ruled and headed), in duplicate sets for alternate months, one set being forwarded at the end of the month to the general office and transcribed on the *record*, while the other set is being used at the shop for the current month. These several books contain separately, *wheels received*, *wheels applied to axles*, *wheels applied to cars or engines*, *wheels removed from cars or engines*, and *wheels removed from axles*. The information on the wheel is given, with the dates of application or removal, the numbers of the engines or cars and the causes of removal, as required by the respective books. Mates are entered in pairs.

The invoices from makers, which contain the numbers of the wheels received, are a check upon the first book, and all the other books check each other.

The *Wheel Record*, upon which the above entries are made, is a large book, ruled and headed, with numbers down each page, running consecutively, sufficient space being allowed for several applications and removals. Separate books are had for each maker, and though during a long period of time many will accumulate, yet never does any complication or difficulty ensue therefrom. To keep both the mileage and wheel record, only three to five clerks are required on the largest roads, where 20,000 wheels and upwards are condemned annually. I have given simply the basis of operations. There are, of course, many collateral papers, etc., which it would not be easy to describe, or their manner of being used, except at considerable length. Monthly transcripts from the *Record*, from which statistics are made out, forms for returning to makers wheels that fail to perform the guaranteed mileage, which have to be replaced by new ones; and many others.

This record has been practically worked on one of the largest roads in this country for ten years past, and its results have proved it by far the most successful, perfect and satisfactory known.

The statistics show for each maker the exact mileage of wheels of different sizes, under engines, tenders and passenger cars, separately, and the *accurate time* (in months and days) that wheels have served under all freight cars, from which a mileage can be estimated; the various causes for which condemned, classified; the percentage of failures, for each kind of service, for each maker; the actual amount of work done at each shop in axle-work, applying and removing, etc., by which an estimate can be made of the amount of money to be appropriated annually for all wheel purposes. Statements also show monthly the number of new and second-class wheels applied to and removed from engines, tenders and the different classes of cars, separately; the number received, condemned and on hand.

A great benefit accruing from the Record is the information it affords, whereby economy of wheels is presented, by utilizing all good ones and preventing waste or their accumulation in large numbers along the line of the road. The results in this alone have shown an enormous saving.

I will only add that if this important subject was carefully studied and investigated, the field for economy in wheels would be found to be vast beyond conception.

Good wheels would be the result of a good *Record*. Accidents would then be fewer, the community would feel safer, honest manufacturers protected, and railway companies would become richer. In fact, there would be general benefit to all, excepting such as now derive profit from poor manufactures.

Why, in these days of progress and enlightenment, should such a beneficial state of things be postponed?

WHEEL RECORD.

The Permanent Way of the Pennsylvania Railroad.

We give a full-page engraving this week of the new rail sections and fish-plates recently adopted by the Pennsylvania Railroad. These are very similar to that designed by Mr. Chanute for the Erie Railway, and illustrated in the *Railroad Gazette* of February 6 of this year, and we believe it was from that form that the patterns we illustrate this week were evolved.

The fish-plates, it will be seen, are of the bracket form on only one side of the rail, whereas in the Erie pattern the fish-plates are of that form on each side.

The sections for the two sizes of rails are of the same form and proportions between the head and foot, so that the same fish-plates will fit each size of rail. The nuts are prevented from turning by the use of Loomis' nut-lock washer. Fig. 3 represents the form of the holes in the inside fish-plate. The bolts are made of the same form under the head, and are thus prevented from turning. The holes in the rails are drilled, and are of course round. The holes in the outside or bracket-formed fish-plate are also of the same form. Fig. 4 represents a side view of the outside of the rail-joint and fish-plate, and is made to a scale of 3 in. = 1 foot.

Fig. 5 represents a section of double-track road with gravel and with broken stone ballast. The specifications for the permanent way we published in the *Railroad Gazette* of December 5, 1874. On the editorial page some comments will be found on the form and proportions of rail sections.

Railroad Manufactures.

The Cleveland Iron Company, of Cleveland, O., has filed a certificate of the increase of its capital stock from $300,000 to $500,000.

The National Bridge Company of Boston has the contract for the three iron bridges needed for the approach to the new union depot at Worcester, Mass.

The Port Clinton (Pa.) Rolling Mill resumed work July 12.

The only blast furnace now in operation in Clarion County, Pa., is the Red Bank furnace of Reynolds & Moorhead.

The *Iron Age* says: "The Pittsburgh Bolt Company, which was compelled to make an assignment on account of the suspension of the firm of Gerry, Tilton & Caldwell, iron brokers, of New York, will continue operation until the stock is worked up and all orders are filled. The stockholders hope that arrangements can be made that will bring their financial difficulties to a satisfactory end."

The Danforth Locomotive Works at Paterson, N. J., have been turning out several engines for the Delaware, Lackawanna & Western, Morris & Essex Division. Two of these engines have been named the "Charles Danforth" and the "John Cooke," after the former and present President of the Danforth Company, probably as a recognition of the friendly relations that have always existed between that company and the Morris & Essex and Delaware, Lackawanna & Western.

The Globe Iron Works at Cleveland, O., have recently completed a dummy engine for the Lake View & Collamer road.

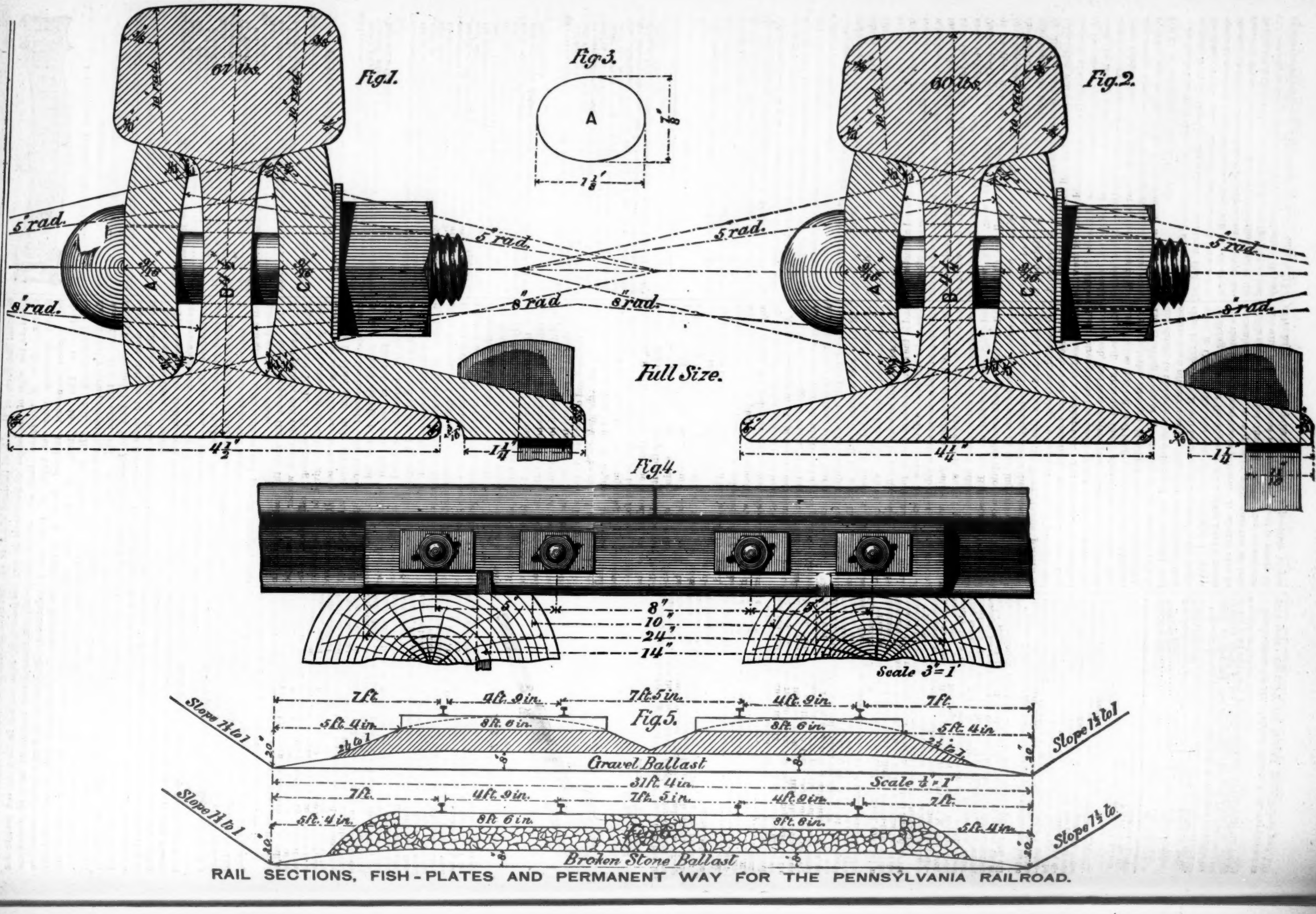
The firm of Seath & Hager, of Terre Haute, Ind., have turned their business over to an incorporated company, the name of which is the Terre Haute Car & Manufacturing Company. The new organization has filed its articles of association under the Indiana general law. The directors are L. G. Hager, J. B. Hager, and James Seath.

The Harrisburg (Pa.) Car Works are running upon a contract for the New York Central & Hudson River.

The Wason Manufacturing Company at Springfield, Mass., has finished work on the large order for passenger cars for the Central of New Jersey's new Long Branch line. About 200 men are at work in the shops, and the company hopes to run through the Summer without diminishing its force.

The Kimball Manufacturing Company of San Francisco has been building some cars for the new Vaca Valley Extension road.

The Delaware Bridge Company has the contract for a new iron bridge over the Passaic River at Newark, N. J., for the Delaware, Lackawanna & Western Company.



RAIL SECTIONS, FISH-PLATES AND PERMANENT WAY FOR THE PENNSYLVANIA RAILROAD.

RAILROAD GAZETTE

Published Every Saturday.

CONDUCTED BY

S. WRIGHT DUNNING AND M. N. FORNEY.

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Editorial Announcements.

Addresses.—*Business letters should be addressed and drafts made payable to* THE RAILROAD GAZETTE. *Communications for the attention of the Editors should be addressed* EDITOR RAILROAD GAZETTE.

Contributions.—*Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies, the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and in their management, particulars as to the business of railroads, and suggestions as to its improvement. Discussions of subjects pertaining to* ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

Advertisements.—*We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and those only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.*

RAILS.

On another page will be found illustrations of the rail sections recently adopted by the Pennsylvania Railroad Company as the standard for its lines. In the *Railroad Gazette* of June 26 we gave an engraving of the form of the sections used on the Baltimore & Ohio Railroad. By comparing these it will be seen that they differ very widely in their form. As they are to a certain extent representative of the different systems in use, we propose giving a little consideration to the reasons for preferring one form rather than the other.

On comparing the Pennsylvania 67 lbs. rail with the Baltimore & Ohio 72 lbs. pattern, one of the first things which will be noticed is the thickness of the web of the latter compared with that of the former. In the one it is over ¾ in. thick, and in the other only ½ in. As the traffic of these two roads and the general character and location of the lines are very similar to each other, it would seem that there could hardly be any good reason for so radical a difference. Let it not be supposed, either, that the latter is unimportant. While the width of that portion of the head of the Baltimore & Ohio rail which is exposed to wear, the width of its base, and also the height of the rail are all less than the same dimensions of the Pennsylvania pattern, the weight of the former is five pounds per yard greater than that of the latter. This difference is chiefly due to the difference in the thickness of the webs. A very simple calculation will show that this will amount to 17,600 lbs. per mile of single track, or for a double track for the whole of the main line 379 miles—of the Baltimore & Ohio road, to nearly 6,000 tons, which, at $50 per ton, would cost the very respectable sum of $300,000. Now of course if the thicker flange increases the wear or the safety of the rails in the same or a greater proportion to their cost, then the one rail might be as economical as the other. But let us see whether this is the case.

In the Baltimore & Ohio rail the surface first exposed to wear from the tread of the wheels is less than that of the Pennsylvania rail. After the Baltimore & Ohio rail is worn down about ¼ in., the top surface will be of about the same width as that of the Pennsylvania section before it is worn. As the maximum width of the head of the Baltimore & Ohio rail is greater than that of the Pennsylvania section, as the former wears down still farther it may present more surface to the wear of the tread; but it will be seen that the form of the side of the head which is exposed to the wear of the flanges of the wheels is very convex. Now it is found that on curves the flanges invariably wear the heads of rails into a flat surface somewhat inclined from a perpendicular, or like the form of the side of the Pennsylvania rail. It is, therefore, evident that the latter form presents much more surface to flange wear than does the other rail. It may, therefore, we think, be concluded that the Pennsylvania pattern presents more surface to resist the wear of the wheels than the Baltimore & Ohio. The amount of material in the heads of each is about the same.

The base of the Baltimore & Ohio section, although it has somewhat more material in it than there is in that of the Pennsylvania pattern, is narrower, and therefore has less bearing surface on the ties. Although there is more material in the base of the one than in that of the other, it is believed that the greater height of the Pennsylvania rail will give it more stiffness and greater strength, considered simply as a beam.

It is found, however, that with the best fastenings in use the rail joint is still very much weaker and less rigid than the rail itself. In designing a rail section, therefore, special attention should be given to its adaptation to the fastenings which are to be used. If fish-plates are used, it is plain that their efficiency will depend very much upon the nature of their bearings against the rail. If they consist simply of two flat bars of iron bolted against the web of the rail, their capacity to transfer the wave of depression produced by a load on one rail to that in front of it will be dependent solely on the friction of the plates against the rail, and the strength of the bolts. If, however, the plates bear against the flanges at the bottom, and against a shoulder under the head of the rail at the top, the bolts will to a very great extent be relieved of the strain on the fish-plates, produced by the depression of the end of one or both rails at a joint. If the shoulders against which the fish-plates bear are very steeply inclined, as is the case in the old pear-headed rail, then the strain on the inclination has a tendency to force the fish-plates outward when the rails are depressed and the plates thus subjected to a strain. At the same time there should be sufficient inclination to the shoulder, both under the head and on the base, to enable the plates to be tightened by screwing up the bolts should they get loose. An inclination of from 12 to 15 degrees has been found sufficient for this purpose. By comparing the Baltimore & Ohio rail section with the last pattern for the Pennsylvania road, it will be seen that the shoulder under the head of the former is so steep that it would be very inefficient in resisting the strains on the fish-plates, and at the same time there must be a tendency to force the plates outward when the ends of the rails are depressed. In the Pennsylvania section there are broad shoulders under the head, against which the fish-plates bear and which will resist the strains to which the plates are subjected with very little if any aid from the bolts, excepting that which they render by holding the plates against their bearings.

As the bearings of the plates are constantly subjected to wear by the passage of trains, it is important that the surface exposed to wear should be as large as possible. There is no difficulty in getting all the bearing surface needed on the base of the rail, but with a comparatively narrow head and thick web or stem it will be seen that the surface must necessarily be limited. If, however, the side of the head is inclined to the form into which, as has been already stated, it will be worn by the flanges of the wheels, and if the stem is made as thin as practicable, the shoulders under the head will of course be widened. It will thus be seen that by using a thin web or stem, and making the shape of the rail conform to that to which it will be worn by the action of the wheels, we at the same time secure a form of rail which is best adapted for a fish-plate fastening. The fact that on the Baltimore & Ohio road rails are fastened with a wooden splice on one side does not diminish, but rather adds to, the importance of having a broad and effective bearing under the head of the rail.

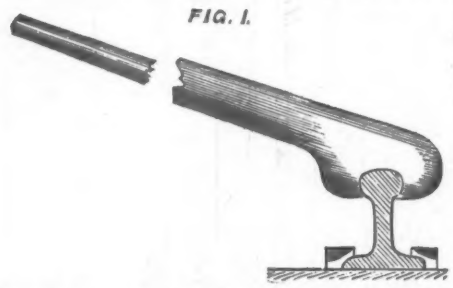
It will be seen, then, that the Pennsylvania pattern of rail has every advantage in its favor so far as strength and resistance to wear are concerned, excepting as these may be increased by a thicker web. For the latter it is claimed that it strengthens the head to resist breaking down close to the web, and that it gives greater lateral strength to the whole rail. Although these claims are doubtless true, nevertheless it is believed that by increasing the thickness of the web the strength is added when it is not needed. The breaking down or splintering of the heads of rails is due chiefly to the imperfect welding of the material, and occurs much oftener near the edges of the rail-head than close to the web. It will be noticed, too, that in the Baltimore & Ohio section the amount of material to resist breaking down near the edges or sides of the head is much less than in the Pennsylvania pattern. It should also be remembered that it is only with poor qualities of iron which are badly welded that such splintering occurs, and that with a homogeneous material like steel it rarely or never happens. It is quite true that it is possible to put too little material in the heads of rails, as was illustrated in the use of those similar in form to the pattern for which the Pennsylvania section we have illustrated was substituted. Rails similar in form to these were used on the Baltimore & Ohio Railroad, and, we are told, broke down through the head. How far this was due to the form, and how far to poor material, we are not able to say.

The great advantage, then, of a thick web in a rail must be due to the lateral strength which it gives. If, however, it can be shown that this additional strength is not needed and that webs even thinner than those of the Pennsylvania sections still give sufficient strength to the rail acting as a beam, and even greater lateral strength than the spikes will resist, then obviously there can be very little reason for adding to their weight and cost by making the webs thicker.

In the year 1870 we published in the *Railroad Gazette* a report of "Experiments on the Stability of Permanent Way," by Baron von Weber, of which we reprint here that portion referring to the "experiments for determining the thickness required for the central web of rails:"

"Baron von Weber desired to ascertain what was the *minimum* thickness which would be given to the web of a rail, in order that the latter might still possess a greater power of resistance to lateral forces than the fastenings by which it was secured to the sleepers. For this purpose a piece of rail 6 ft. in length, rolled of the best iron at the Laurahutte in Silesia, was supported at distances of 35.43 in., and loaded nearly to the limit of elasticity (which had been determined previously by experiments on other pieces of the same rail), and the deflections were then measured with great care by an instrument capable of registering 1-1000 in. with accuracy. This having been done, the web of the piece of rail was planed down, and each time that its thickness had been reduced three millimetres, the vertical deflection of the rail under the above load was again tested, and the rail was subjected to the following rough, but practical, experiments. The piece of rail was fastened to twice as many fir sleepers by double the number of spikes which would be employed in practice, and a lateral pressure was then applied to the head of the rail by means of a lifting jack, until the rail began to cant and the spikes were drawn. The same thing was then done by a sudden pull, the apparatus used being a long lever fastened to the top of the rail, as shown in Fig. 1. The lifting jack and the lever were applied to the ends of the rail, and the web of the latter had in each case to resist the whole strain required for drawing out the spikes. The results of the experiments made to ascertain the resistance of the rail to vertical flexure with different thicknesses of web, and under a load of 5,000 lbs., were as follows:

FIG. 1.



Thickness of Web.	Vertical Deflection, in.
15 millimetres = 0.59 in.	0.016
12 " = 0.47 "	0.016
9 " = 0.35 "	0.019
6 " = 0.24 "	0.019
4 " = 0.12 "	0.022

"These results showed ample stiffness even when the web was reduced in thickness to 0.12 in. To determine the power of resistance of the rail to lateral flexure, an impression of the section was taken in lead each time that the spikes were drawn. The forces applied in these experiments were very far greater than those occurring in practice, yet it was found that with the web 12, 9, and even 6 millimetres thick, no distortion took place, and only when the thickness of the web was reduced to 3 millimetres (0.12 in) was a slight permanent lateral deflection of the head caused just as the spikes gave way. The section shown in Fig. 2 had then been reduced to that shown in Fig. 3.

"Next a rail with the web reduced to 3 mil. (0.12 in.) in thickness was placed in the line leading to a turn-table on the Western Railway of Saxony, where it has remained until the present time, receiving more than one hundred times daily the shocks due to engines passing to and from the turn-table.

"It follows from these experiments that the least thickness ever given to the webs of rails in practice is more than sufficient, and that if it were possible to roll webs ⅛ inch thick, such webs would be amply strong if it were not that there would be a chance of their being torn at the points where they are traversed by the fish-plate bolts. Baron von Weber concludes that webs ⅜ in. or ½ in. thick are amply strong enough for rails of any ordinary height, and that in fact the webs should be made as thin as the process of rolling and as the provision of sufficient bearing for the fish-plate bolts will permit.

"Some little time ago another series of experiments on the rigidity and strength of rails was carried out, by order of the Prussian Government, by Herr A. Wohler, the Chief Locomotive Superintendent of the Lower Silesian State Railway. The result of these experiments was the recommendation of a diminished weight but increased height of rail, the central web being diminished in thickness to render this possible. The subjoined table gives the particulars of the sections successively adopted by the Cologne-Minden Company:

	Section No. I. 1844.	Section No. II. 1849.	Section No. III. 1862.
	in.	in.	in.
Height of rail	3.66	4.25	4.75
Width of base	3.86	3.67	3.5
" " head	2.32	2.33	2.25
Thickness of the web	0.625	0.95	0.562
Weight per yard	57 lbs.	72 lbs.	65½ lbs.

"It will be seen by this table that by the last alteration the depth of the rail was increased about 15 per cent., and the strength about 25 per cent.; while, by diminishing the widths of the head and base, and the thickness of the web, the weight was reduced about 10 per cent."

In a memoir by Mr. Ashbel Welch, C. E. appended to the report "On the Form, Weight, Manufacture and Life

of Rails," made to the American Society of Civil Engineers, published in the *Railroad Gazette* of July 25, 1874, that gentleman says that in 1865, he designed forms for rails to be used on the United Railroads of New Jersey. He adopted a 62 lbs. iron rail 4½ inches high, and with a web or stem ½ inch thick. Many thousand tons of these rails were used under his direction, and he says: "After an experience of eight or nine years with such rails, under a heavy traffic, with heavy machinery and high speeds, after much inquiry, I have not been able to find that the half-inch stem has ever compressed or bent sideways, or the head or base has cracked off, or suffered in any way from the sharp re-entering angle with the stem, or that the rail has ever given out, except by wearing, crushing, scaling, splintering, or laminating at the top." Another form of rail which the same gentleman put into use "as an experiment," was 4 inches high, with a web 7-16 inch thick, and base 3-16 inch in the edge. Several hundred tons of steel rails of this pattern were rolled. None of them have ever broken. Some of them were laid in 1868 in Bergen cut, near New York, where the curves are very sharp—less than 600 feet radius—and the speeds high. Probably 36,000,000 to 38,000,000 tons of gross load per annum have since passed over each track laid with these rails. The writer says: "On applying accurate complementary templets to these rails, no stem has been found compressed or bent or deflected from the perpendicular. The templets would show

FIG.2.

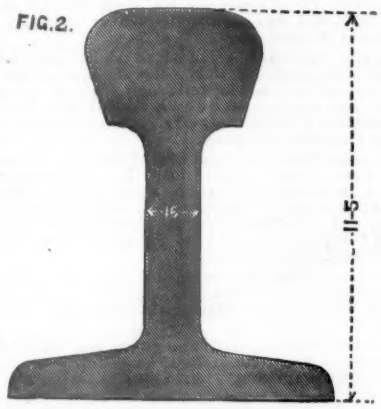
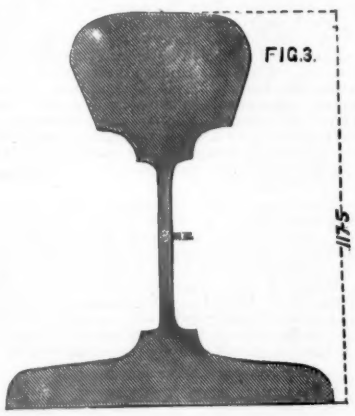


FIG.3.



a deviation of less than one-hundredth of an inch. Except the wear on the heads, the rails are apparently as good as when first laid, some six or seven years ago."

It would seem as if this evidence was entirely sufficient to prove that these "spindle-shanked" rails, as Mr. Welch calls them, are abundantly strong in the web or stem.

During the discussion of the second report of the Committee on Rails made to the American Society of Civil Engineers, at their late Convention at Pittsburgh, Mr. A. L. Holley, whose remarks we publish on another page, called attention to the fact that by making the flanges of rails as thin as was recommended by the Committee there is danger that they will cool before the rolling of the rail is complete, and thus be hardened by the process of rolling. To quote his own language: "We know that rolling or hammering steel of a dark cherry-red heat tends to combine the graphitic carbon, and to that extent to make the steel hard and brittle. When a steel rail with thin flanges is rolled, however fast, even at the rate of fifteen passes in a minute and a half, the flange will come out of the last pass at a dark cherry red, while the head is of a reddish yellow."

Now, while we agree with Mr. Holley that this subject "is worthy of further consideration and experimenting," nevertheless it must be observed that as the objection to their flanges is presented, it is entirely a theoretical one, and if the difficulty actually exists it must soon show itself in practice, either by the breaking of the rails, if the flanges are too hard, or else in a diminished wear if the head is made too soft in order to give the flange the requisite toughness. Mechanical tests made under a drop or some other method would, we believe, determine whether the flanges were too hard and brittle, and other tests would determine the hardness of the head. While we agree with Mr. Holley that it is important to know whether thin flanges will be hardened to a dangerous degree in the process of rolling, if the rails are made of such steel as will wear well in the head, and prove it "on some more scientific ground than the fact that *a great many* thin-flanged steel rails have not yet broken," nevertheless if such rails with thin flanges do not break oftener in proportion to the number laid than those with thicker flanges of the same material, and show an equally good wearing capacity, it is hardly necessary to abandon these flanges on account of "theoretical" considerations alone. As there are thousands of such rails now in use, some of which have been laid from six to eight years, if they were too brittle the fact would have been indicated in this time by frequent breakages, or, if they were too soft, would have become manifest in their diminished resistance to wear.

The fact that rails with thin flanges are more difficult to roll and require better material in order to make that portion come out perfect, is undoubtedly one reason why they have always been unpopular with manufacturers, and probably is also one reason why they have not come into more ge eral use.

The forms of rails now in use in this country seem, with very few exceptions, to have been determined by the Darwinian law of "the survival of the fittest," and in many, if not most cases, rails have been bought without reference to their form. The object in making the above comparison of an old with one of the latest patterns, was to show the importance of adopting the most improved form for rails, and also the influence which the form of section has on the strength, endurance and value of rails.

RAILROAD EARNINGS IN JUNE.

Name of Road.	Mileage. 1875.	1874.	Inc.	Dec.	Per c.	Earnings. 1875.	1874.	Increase.	Decrease.	Per c.	Earnings per Mile. 1875.	1874.
Central Pacific	1,315	1,260	55	.....	4.4	$1,711,000	$1,366,614	$344,386	.....	25.2	$1,301	$1,085
Denver & Rio Grande	120	120	.....	.....	.....	35,329	39,291	.....	$3,962	10.1	2,294	327
Illinois Central	1,109	1,109	.....	.....	.....	599,928	692,416	.....	92,488	13.4	541	624
Indianapolis, Bloomington & Western	344	344	.....	.....	.....	79,377	130,164	.....	50,927	39.1	231	378
International & Great Northern	458	407	51	.....	12.5	74,280	75,144	.....	864	1.1	162	185
Kansas Pacific	761	761	.....	.....	.....	275,665	316,339	.....	40,674	12.8	362	416
Keokuk & Des Moines	161	161	.....	.....	.....	66,488	49,954	16,534	.....	33.1	413	310
Missouri, Kansas & Texas	786	786	.....	.....	.....	218,094	237,420	.....	19,326	8.1	277	302
New Jersey & New York	37	22	15	.....	68.2	16,846	10,458	6,388	.....	61.4	455	475
St. Louis, Alton & Terre H., Main Line	195	195	.....	.....	.....	71,697	99,844	.....	28,147	28.2	*368	512
" " " Branches	71	71	.....	.....	.....	35,619	43,153	.....	7,534	12.8	502	608
St. Louis, Iron Mountain & Southern	685	685	.....	.....	.....	275,300	238,608	36,692	.....	15.4	402	348
St. Louis & Southeastern	349	349	.....	.....	.....	65,033	96,989	.....	31,856	32.8	186	278
Union Pacific	1,032	1,032	.....	.....	.....	930,000	902,881	27,119	.....	3.0	901	875
Totals	7,423	7,302	121	.....	.....	$4,454,666	$4,299,225	$431,119	$275,678	.....	$600	$589
Total increase	.....	.....	121	.....	1.7	.....	.....	155,441	.....	3.6	.....	.....

RAILROAD EARNINGS, SIX MONTHS ENDING JUNE 30.

Name of Road.	Mileage. 1875.	1874.	In.	Dec	Per c.	Earnings. 1875.	1874.	Increase.	Decrease.	P.c.	Earnings per mile. 1875.	1874.	Inc.	Dec.	P.c.
Central Pacific	1,297	1,260	37	....	2.9	$7,847,000	$6,323,963	$1,523,037	.....	24.1	$6,050	$5,019	$1,031	.....	20.6
Cleveland, Col., Cin. & Ind	471	471	....	....	.....	1,734,314	2,017,048	.....	$281,734	14.0	3,683	4,283	.....	$600	14.0
Denver & Rio Grande	120	120	....	....	.....	373,645	169,989	3,656	.....	2.2	1,447	1,417	30	.....	2.2
Illinois Central	1,109	1,109	....	....	.....	3,367,288	3,563,855	.....	196,567	5.5	3,036	3,214	.....	178	5.5
Indianapolis, Bloom. & West	344	344	....	....	.....	586,267	822,693	.....	236,426	28.7	1,704	2,392	.....	688	28.7
International & Great Northern	458	403	55	....	13.6	580,186	571,240	8,946	.....	1.6	1,288	1,417	.....	129	9.1
Kansas Pacific	761	761	....	....	.....	1,450,287	1,519,681	.....	69,394	4.6	1,906	1,997	.....	91	4.6
Keokuk & Des Moines	161	161	....	....	.....	403,886	327,777	76,109	.....	23.2	2,509	2,036	473	.....	23.2
Lake Shore & Mich. Southern	1,175	1,175	....	....	.....	6,941,000	8,728,422	.....	1,787,422	20.5	5,907	7,428	.....	1,521	20.5
Missouri, Kansas & Texas	786	786	....	....	.....	1,238,025	1,429,886	.....	191,861	13.4	1,575	1,819	.....	244	13.4
St. Louis, Alt. & T. H. main line	195	195	....	....	.....	466,875	586,876	.....	120,001	20.4	2,394	3,010	.....	616	20.4
" " " branches	71	71	....	....	.....	277,100	245,689	31,411	.....	12.8	3,903	3,460	443	.....	12.8
St. Louis, Iron Mt. & Southern	685	684	1	....	0.1	1,625,211	1,417,510	207,701	.....	14.7	2,372	2,072	300	.....	14.5
St. Louis & Southeastern	349	349	....	....	.....	479,265	598,750	.....	119,485	20.0	1,373	1,716	.....	343	20.0
Union Pacific	1,032	1,032	....	....	.....	5,413,240	4,563,632	849,608	.....	18.6	5,245	4,422	823	.....	18.6
Totals	9,014	8,921	93	....	.....	32,583,589	32,887,011	$2,700,468	$3,003,800	....	$3,615	$3,686	.....	$71	1.9
Total increase or decrease	.....	.....	93	....	1.0	.....	.....	.....	303,422	0.9	.....	.....	.....	.....	.....

THE MICHIGAN CENTRAL REPORT.

We have made a pretty full analysis of the report of this company for the year ending with May last, which will be found on another page and is worth careful examination. The story it tells is much like that given in reports of other roads similarly situated for the same period—namely, a slight increase of traffic, or no decrease, in spite of the great depression of business, a considerable decrease in earnings owing to a decrease in the average rates received, and on the other hand such a decrease in working expenses as leaves the profits of the year's work not much less than last year. There are some minor notable changes in the traffic, the chief of which perhaps is the large increase of freight traffic westward; the passenger traffic remains nearly stationary, having reached great proportions and prosperity many years ago; the leased branches in no case earn their rentals, in all cases show a decrease in earning, but, owing to a large decrease of expenses on one of them, result pretty nearly the same as last year. The floating debt has been reduced considerably, but the surplus of net earnings after paying interest and rentals is but a trifle, and of course the company has nothing to divide among its stockholders, as it has not had for three years.

Why do we have no dividends, is the burning question among the stockholders, who can easily remember when they got 10 per cent. every year and could sell their shares, now worth 65, for 135 or more. It is to answering this question that Mr. Joy devotes the greater part of his report.

The answer generally given by those dissatisfied with the management is that the directors, either blunderingly or corruptly, leased some six hundred miles of railroad which do not earn enough to pay their rentals. It is quite true that this has been done; but it does not follow that it was not the best thing to do, or even that it has caused the company's misfortunes. We have several times heretofore stated the reasons which led the directors to adopt this policy, and in this report Mr. Joy states them at length and very clearly. This part of his report we will publish hereafter. A quotation from the report of 1871, at the time the leases were made, deserves special attention, as it indicates that at that time it was not claimed that the new lines would be directly profitable, but that the control of them was desirable to prevent a considerable loss.

But we think that the effect of these leases, whether on the whole wise or unwise, has been exaggerated. The separate accounts of all except the Michigan Air Line show that the direct net loss resulting from them was about $430,000 last year. This is a large sum, doubtless, but it is not nearly enough to pay a 10 per cent. dividend on the Michigan Central's stock—is, indeed, only equivalent to a dividend of 2½ per cent.

Mr. Joy also argues at length to show that the large expenditures made of late years in improving the road and increasing its equipment were not the cause of the lack of a surplus for dividends. This seems to us too plain a case to deserve much argument; no man, unless so ignorant of railroad matters as to suppose that this company could keep up its rates when competing companies had reduced theirs, can believe that the Michigan Central would not have been bankrupt before this if it had not the facilities which enable it to do its work much cheaper than it could a few years ago. A very few lines will show this.

In 1869–70 the average expense per ton per mile to the Michigan Central for carrying over its road was 1.27 cents. It received for this service 1.98 cents, and made profit enough to pay a 10 per cent. dividend. In 1874–75 its receipt for this same work was 1.16 cents, and evidently if it had cost it as much to do the work as it did five years ago, it would have failed to meet its working expenses by 0.11 cent per ton-mile, and there would have been a *loss* of $440,000 on its freight traffic. But, mainly through the improvements introduced, while the receipt per ton per mile has fallen through causes over which the company has no control from 1.98 to 1.16 cents, the expense has also been brought down from 1.27 to 0.77 cent. The reduction in the receipt has been 0.82 cent., that in the cost 0.50 cent., and consequently the company makes a less profit per ton per mile by 0.32 cent.—which sufficiently accounts for the non-earning of dividends: it makes a difference of $1,200,000 in the net earnings on last year's traffic.

The cost of working on the Michigan Central continues

one of the lowest reported. For passengers it is the same as reported for the Pennsylvania Railroad for 1874 (1.60 cents per mile); for freight it is 0.77 cents per ton per mile, against the Pennsylvania's 0.72 cent in 1874. No reasonable man, in view of these facts, can say that the expenditures on improvements of the Michigan Central main line have not been justified. They have doubtless saved it from bankruptcy.

The prospects of this road depend of course very largely on the general condition of business in the country and the cessation of insane competition. The President holds forth the hope of a still greater reduction of expenses, but it can hardly be expected that enough can be saved in this way to make a dividend. Such an increase of business as might reasonably be expected, however, coupled with some improvement in rates, would put it on the right road very quickly. At last year's rate of profits it would require an increase of about one-third in the freight traffic of the company. Even so large an increase is not impossible, and from 1872-3 to 1873-4 this same road had an increase nearly as large—30 per cent. But the condition of affairs, though promising at least some increase in traffic, is not such as lead us to expect so large a one next year, while as to rates, it seems impossible to predict anything.

Preserving Railroad Credit.

Railroad credit is a tender plant, and often has to be protected by expensive methods. Examples are to be found in some dependencies of the Central Pacific Company in California. This company leased, or its directors bought, nearly all the railroads in California. Some of these turned out anything but profitable, and, like so many new railroads this side of the Rocky Mountains, the net earnings were less than the interest on the funded debt, or even less than the working expenses. Now elsewhere in the United States (and in the world, we believe), when a railroad company fails to earn the interest on the bonds, it usually fails, and the bondholders have to be content with what it does earn—if, indeed, they get that. But the holders of bonds of the unprofitable California railroads have fared better. The fact that the present owners of these roads are the men who are also chief owners of the Central and Southern Pacific railroads has compelled them to neglect taking the advantage of ordinary stockholders in corporations, who are liable only to the extent of their stock subscriptions, and when these are fully paid have no personal responsibility for the debts of the companies in which they are shareholders. Here were the California Pacific and Stockton & Copperopolis companies, both apparently hopelessly bankrupt; neither earning enough, or ever likely to earn enough, to pay any large proportion of the interest or any part at all of the principal of their debts. But the world (and with it the bondholders) knew that these companies were in some way controlled by the Central Pacific, or by the half-dozen eminent Californians who control the Central and the Southern Pacific. The world would be likely to charge any failure to meet the engagements of these former companies upon the latter greater ones, which have always had excellent credit at home and abroad, and have had and will probably often have hereafter occasion to use that credit. The world would say, should there be a default, "Stanford, Huntington, Crocker, Hopkins and the rest were substantially the California Pacific; we have lost our money in the California Pacific; now the Central Pacific or the Southern Pacific asks our money for a great extension or improvement; but the Central Pacific and the Southern Pacific are also virtually nothing but Stanford, Huntington, Crocker, Hopkins and the rest. We shall not lose our money to them twice." But these gentlemen have foreseen this, and they have taken pains that such a charge shall not be made. The California Pacific seemed utterly hopeless, with a traffic hardly more than enough to pay working expenses and an enormous debt, but the California Pacific, which is substantially half a dozen rich men with good credit which is indispensable to them, has made terms with its bondholders which apparently will secure them more than the road will ever earn: the Stockton & Copperopolis, by the failure of mines which it was built to serve, seemed likely to prove virtually useless, with no or scarcely any net income; but its bondholders have completed an agreement by which these $1,000 8 per cent. bonds, worth virtually nothing if dependent solely on the Stockton & Copperopolis Railroad, will be exchanged for $500 5 per cent. bonds, guaranteed by the Central Pacific Company, and one of the best securities in the market. There was nothing in law, and in the ordinary way of looking at things, nothing in equity, to compel these stockholders, lessees and proprietors of the Stockton & Copperopolis Railroad to give their creditors anything more than the railroad by which their bonds were secured for their claims; but they did it nevertheless, at a cost of something like half a million dollars; and they probably will find their advantage in doing it. Before long these same gentlemen will have some Southern Pacific bonds for sale, and their liberality in doing more than they promised for the bondholders in the companies which failed will doubtless have considerable effect, as it ought to have, in giving confidence in the new issue.

This is but another way of saying that those who make sacrifices to preserve their credit will be more likely to keep it good than those who pay just what the law compels them to, and not a farthing more.

Record of New Railroad Construction.

This number of the *Railroad Gazette* has information of the laying of track on new railroads as follows:

Utica, Ithaca & Elmira.—The *Ithaca Division* has been extended from Wilseyville southward to Candor, N. Y., 6 miles.

Rome, Watertown & Ogdensburg.—The *Lake Ontario Division* is extended westward 5 miles to a point 14 miles west from Charlotte, N. Y.

Chicago, Clinton & Western.—The first track is laid from Clinton, Ia., west by south 15 miles to the Wapsipinicon River.

Puebla & Arkansas Valley.—Track has been extended westward 23½ miles to a point 30 miles west from Granada, Cal.

Galveston, Harrisburg & San Antonio.—Extended from Lueling, Texas, westward, 11⅛ miles to Kingsbury.

This is a total of 61 miles of new railroad, making 518 miles completed in the United States in 1875, against 727 miles reported from the same period in 1874 and 1,696 in 1873.

RAILROAD CONSTRUCTION seems to be in a bad way the world over. The recent report of the British Board of Trade of the exports for the first half of the year show that 259,307 tons of railroad iron of all kinds were exported in 1875, against 427,267 tons in 1874. The exports last year were sufficient to lay 4,805 miles of track with 56-lb. iron; those of this year, only enough for 2,947 miles, or 1,858 miles less. Roughly speaking, the exports of this year were about sufficient for the maintenance of 40,000 miles of ordinary iron track during the half-year.

All this is evidence that the suspension of railroad construction has been general, and not confined to the United States alone. Of course England is not the only manufacturer of rails, but it is by far the greatest *exporter* of rails, and its exports are a pretty good clue to the activity in construction in countries which do not produce rails. For the last half-year no country has taken rails enough to make 500 miles of road, which would hardly leave any margin for new construction in a country with 3,000 miles of railroad to maintain carrying a considerable traffic.

THE CHICAGO AND NORTHWESTERN RAILWAY has had a most trying year, as, being a wheat road, its traffic was greatly affected by the decline in the demand; and the oppression of the Wisconsin law has been added to other misfortunes. Notwithstanding these, the Treasurer reports the surplus of net earnings for the last fiscal year, (ending with May last), after paying rentals and interest, to have been $1,366,000. The surplus for the previous year, (when the crop of wheat raised was the heaviest ever known), was $2,119,000. The surplus for the last year is very nearly 3¾ per cent. on the whole stock, common and preferred, and is 6.36 per cent. on the preferred stock. This as a result of a most trying year, with very light traffic, very low rates, and a most trying winter, is decidedly encouraging, and is likely to strengthen confidence in all the securities of the company, which will feel more than any other save perhaps one the stimulus of the probably heavy wheat movement of the coming crop year.

THE BALTIMORE & OHIO RAILROAD is usually assumed to be sole feeder of the city of Baltimore, and especially the instrument by which it has acquired its considerable grain traffic. Reports of the receipts for June, however, indicate that its rival shares this traffic on not very unequal terms. These receipts were:

	1875.	1874.
By Baltimore & Ohio	1,256 car-loads.	1,859 car-loads.
By Northern Central	1,070 car-loads.	690 car-loads.
Total	2,326 car-loads.	2,549 car-loads.

The result of the greater competition would seem to be that the Baltimore & Ohio lost grain traffic which the Pennsylvania and Northern Central gained; though, at the current rates, the road carrying the most profited the least, probably, except it demonstrated its ability to command traffic.

General Railroad News.

ELECTIONS AND APPOINTMENTS.

Danville & New River.—This company was organized at Martinsville, Henry County, Va., July 13, by the election of the following directors and officers: President, Hon. C. Y. Thomas, Martinsville, Va.; Vice-President, Abner Anderson, Danville, Va.; Secretary, C. J. Griffith; Treasurer, John M. Johnson, Danville, Va.; directors, Henry C. Lester, S. J. Mullins, John H. Schoolfield, James M. Smith, Jr., W. D. Stultz, Henry County, Va.; Wm. T. Clark, John D. Glass, L. M. Shumaker, Wm. T. Sutherlin, R. H. Trotter, Danville, Va.

Amador Branch.—The first board of directors is as follows: D. D. Colton, Charles Crocker, Mark Hopkins, C. P. Huntington, Leland Stanford. They are all connected with the Central Pacific.

Allegheny Valley.—Mr. J. Morton Hall has been appointed General Passenger and Ticket Agent, with office in Pittsburgh, Pa.

Pound Gap.—The new board of directors is as follows: R. J. Samuel, W. Dwight, Jr., Cincinnati, O.; J. F. Sullivan, V. Shinkle, J. D. Hearne, John Gray, James O'Hara, F. A. Prague, W. M. Leathers, R. H. Deglow, Covington, Ky.; George W. Jameson, Pendleton, Ky.; George B. Poage, Bracken County, Ky.; W. T. Sallee, Mason County, Ky.; W. H. Hendrick, Thomas Hart, Fleming County, Ky. Mr. J. T. Sullivan is President and Col. R. J. Samuel, Vice-President,

Little Rock & Fort Smith.—Col. W. D. Slack, of Pennsylvania, has been appointed Land Commissioner, *vice* Judge N. S. Howe, resigned. He will take charge of the office October 1.

Evansville, Owensboro & Nashville.—Mr. R. S. Triplett, of Owensboro, Ky., has been appointed Receiver until the creditors choose an assignee in bankruptcy.

Missouri, Kansas & Texas.—Mr. H. H. Courtright has declined the position of General Freight Agent, which was offered to him, and prefers to remain on the Hannibal & St. Joseph in the same position.

Petersburg.—Mr. Isaac H. Carrington, of Richmond, Va., has been chosen President in place of Reuben Ragland, resigned.

Pittsburgh, Cincinnati & St. Louis.—Mr. Ross Kells has been appointed Master Mechanic of the Pittsburgh & Columbus Division, in place of Mr. E. Pierce, deceased.

Texas Midland, Gulf & New Orleans.—At the annual meeting in Waco, Tex., July 6, the following directors were chosen: G. C. McGregor, E. A. Sturgis, D. T. Chamberlin, Waco, Tex.; James B. Robertson, Austin, Tex.; Norman A. Smith, J. N. Orvis, New York; James McKaye, W. A. Taylor, John A. Harrington, London, England. The board elected James McKaye President; W. A. Taylor, Vice-President; J. C. Colton, New York, Secretary and Treasurer; D. T. Chamberlin, Assistant Treasurer.

Anacostia & Potomac.—The stockholders met in Washington, July 12, and chose the following directors: Noble Young, Edward Temple, R. B. Clark, H. A. Griswold, Alfred Richards, L. W. Guinand, John Webster, Zadoc Williams, G. A. Bohrer. The board elected officers as follows: President, L. W. Guinand; Secretary, H. A. Griswold; Treasurer, Thomas A. Richards.

Hanover Junction & Susquehanna.—The officers of this company are as follows: President, R. T. Ryan; Secretary and Treasurer, John S. Given; Chief Engineer, Samuel Mifflin; Engineer in Charge of Construction, George Mifflin. The office of the company is at Columbia, Lancaster County, Pennsylvania.

Grand Rapids & Indiana.—At the annual meeting in Grand Rapids, Mich., July 21, the following directors were chosen: W. O. Hughart, H. J. Hollister, Grand Rapids, Mich.; Jonathan G. Wait, Sturgis, Mich.; Pliny Hoagland, Franklin P. Randall, Fort Wayne, Ind.; Mancell Talcott, Chicago, Ill.; J. N. McCullough, Thomas D. Messler, Wm. Thaw, Pittsburgh, Pa.; Thomas A. Scott, George B. Roberts, Philadelphia. The board re-elected W. O. Hughart, President; W. R. Shelby, Secretary and Treasurer; J. H. Page, General Passenger and Ticket Agent; A. B. Leet, General Freight Agent; F. A. Gorham, Auditor; H. D. Wallen, Jr., Superintendent Northern Division; J. M. Metheany, Superintendent Southern Division; D. Darwin Hughes, General Solicitor.

Knoxville & Charleston.—The new company has been organized by the election of Dr. Wm. Morrow, President, and W. H. Cherry, Vice-President.

PERSONAL.

—Mr. George H. Mumford, Vice-President of the Western Union Telegraph Company, died in Paris, France, whither he had gone for the benefit of his health, July 26. He had been connected with the company for ten years, three of them as Vice-President, and was highly esteemed as an officer and a man. He was 36 years old.

—Mr. Wylie H. Oldham, a lawyer of ability and formerly prominent in the politics of what is now the State of West Virginia, died at his residence in Marietta, O., July 21, of typhoid fever. He was long connected with the Baltimore & Ohio as counsel, and for a number of years has been a director of the Marietta & Cincinnati Company.

—At the recent commencement of the University of Vermont, honorary degrees were conferred upon Mr. J. T. Dodge, Chief Engineer of the Chicago, Milwaukee & St. Paul Railway, and Mr. J. M. Clark, Resident Engineer of the Central Railroad of New Jersey and Chief Engineer of the American Dock & Improvement Company. Both of these gentlemen graduated from the University in the class of 1845.

—Mr. Reuben Ragland has resigned his position as President of the Petersburg Railroad Company, a position which he has held during several years of almost incessant controversy and trouble.

—Dr. J. Stewart Leech, of Downingtown, has tendered his resignation to the Pennsylvania Railroad Company as Surgeon of the Philadelphia Division, which appointment he has held for 37 years.

—Mr. H. A. Gardner, Chief Engineer of the Michigan Central Railroad, died in Chicago, July 26, after a protracted illness. Mr. Gardner was a native of South Lee, Mass., and had been connected with railroads for many years. He was associated with the now venerable Col. R. P. Morgan (his father-in-law) in making the surveys for the Hudson River road, and afterwards succeeded Mr. John B. Jervis as Engineer in charge of its construction. He was subsequently for several years Chief Engineer of the Pittsburgh, Fort Wayne & Chicago. As an engineer, Mr. Gardner had a high reputation, which he well earned by his judgment, integrity and wide experience. He had been a member of the American Society of Civil Engineers almost from its first formation.

—The great banking house of Duncan, Sherman & Co., in New York, has been forced to suspend, and closed its doors July 27. The senior member of the firm, Mr. Wm. Butler Duncan, is widely known as a large investor in railroad securities, and as an officer and director in many companies. He is President of the Mobile & Ohio, and up to the last election was a director of the Erie. For a long time the firm were the bankers of Commodore Vanderbilt; until very recently of the Erie, and was active in the Atlantic & Great Western reorganization and other schemes which were closely connected with it.

TRAFFIC AND EARNINGS.

Coal Movement.

The coal tonnages reported for the week ending July 17 were as follows:

	1875.	1874.	Inc. or Dec.	P. c.
Anthracite	567,881	234,298	Inc. 333,583	142.4
Semi-bituminous, Broad Top and Clearfield	23,340	.....	.....	....
Cumberland	58,916	.....	.....	....
Bituminous, Barclay	7,124	.....	.....	....
" Western Pa.	36,518	.....	.....	....
" West Va.	3,546	.....	.....	....
Coke, Western Pa.	14,948	.....	.....	....

The enormous increase in anthracite will be remarked. It is in part the result of the abnormal activity succeeding the long strike, but there is also a heavy increase on some of the lines not affected by the strike. During July of last year production was decreased by all of the large companies, most of them having heavy stocks on hand.

The coal tonnage of the Pennsylvania Railroad for the second week in July was as follows:

	Tons.
Anthracite	19,514
Bituminous	61,764
Coke	14,963
Total	97,281

The *Engineering and Mining Journal* reports the following as the production of bituminous coal, so far as reports have been received, for the six months ending July 1:

	Tons.
Pennsylvania	4,536,719
Maryland	1,198,010
Illinois	370,856
Ohio	313,579
West Virginia	80,325
Wyoming Territory	61,362
Iowa	46,406
Tennessee	43,037
Alabama	28,269
Indiana	25,201
Colorado	12,056
Total	6,715,917

In Maryland, where all the coal is produced in a small district, the returns are complete; in Pennsylvania they are probably nearly so. In most of the other States they are far from being full. The anthracite coal reported for the same period was 6,431,219 tons, or nearly as much as the bituminous, but it must be remembered that the anthracite production is confined

to a small area, and is all either owned or handled by a few companies, and little or none of it is omitted from the returns. The total production of both kinds reported would fill 1,314,714 eight-wheeled cars, and would make 52,589 trains of 25 cars each.

San Francisco coal receipts for the six months ending June 30, were as follows:

	1875.	1874.	Inc. or Dec.
California Coal	75,700	88,200	Dec..12,500
Coos Bay, Oregon	17,900	26,700	Dec.. 8,800
Bellingham Bay and Seattle	29,500	10,100	Inc..19,400
British Columbia	29,100	26,300	Inc.. 2,800
Eastern, Anthracite and Cumberland	12,800	7,900	Inc.. 4,900
Wyoming Territory	30	300	Dec.. 270
Australian	49,200	34,300	Inc..14,900
English	22,700	1,700	Inc..21,000
Totals	236,930	195,500	Inc..41,430

Only the insignificant amount from Wyoming comes by rail, the balance all by water. The California product is from the Mount Diablo mines. The Australian and English coals are brought by vessels coming after cargoes of wheat or flour.

Railroad Earnings.

The following companies have reported earnings for various periods:

Year ending April 30:	1874-75.	1873-74.	Inc. or Dec.	P. c.
Evansville, Terre Haute & Chicago	$236,369	$216,737	Inc.. $19,632	9.0
Expenses	122,180	124,808	Dec.. 2,628	2.1
Net earnings	$114,089	$91,929	Inc.. $22,160	24.1
Earnings per mile	4,296	3,941	Inc.. 355	9.0
Per cent. of expenses	51.71	57.58	Dec.. 5.87	10.2
Year ending May 31:	1874-75.	1873-74.		
Michigan Central	$7,102,286	$7,634,082	Dec.. $531,796	7.0
Expenses and taxes	5,068,098	5,523,642	Dec.. 455,544	8.2
Net earnings	$2,034,188	$2,110,440	Dec.. $76,252	3.6
Earnings per mile	9,864	9,495	Dec.. 661	7.0
Per cent. of expenses	71.35	73.35	Dec.. 2.00	2.7
Year ending June 30:	1874-75.			
Peach Bottom	$15,694	.....	.....	....
Second week of July:	1875.	1874.		
Denver & Rio Grande	$6,653	$9,550	Dec.. $2,897	30.3
St. Louis, Iron Mt. & So.	58,000	56,962	Inc.. 1,038	1.8
Two weeks ending July 9:				
Great Western	£28,890	£36,852	Dec.. £7,962	21.6
Two weeks ending July 10:				
Grand Trunk	£74,000	£81,400	Dec.. £7,400	9.1

Iron Movement.

The shipments of iron ore and pig iron from the Lake Superior region from the opening of navigation up to July 7 were as follows:

	Ore, tons.	Pig, tons.
Marquette	137,583	8,178
L'Anse	17,582	....
Grand Island	....	2,292
Escanaba	74,167	6,210
Totals	229,332	16,680

Petroleum Rates.

An adjourned meeting of representatives of the New York Central & Hudson River, the Erie, the Pennsylvania and the Baltimore & Ohio was held in New York, July 24, for the purpose of fixing the rates to be charged on petroleum, and on a basis for a division of business. There was a long discussion, but a final settlement was postponed to another meeting.

Railroad Traffic.

The Central Pacific reports for June a passenger traffic smaller than that of the preceding month, but large as compared with last year. For the six months ending June 30 the arrivals of through passengers at and departures from California points were as follows:

	1875.	1874.	Increase.	P. c.
Arrived	39,626	23,770	15,856	64.7
Departed	13,477	10,899	2,578	23.7
Total	53,103	34,669	18,434	53.2

Flour and Grain Movement.

Receipts and shipments for the week ending July 17 are reported as follows:

Flour:	1875.	1874.	Inc. or Dec.	P. c.
Lake ports' receipts	81,779	78,114	Inc.. 3,665	4.7
" " shipments	96,510	114,259	Dec.. 17,749	13.6
Atlantic ports' receipts	151,436	129,764	Inc.. 21,672	16.7
Wheat:				
Lake ports' receipts	1,685,712	1,075,267	Inc.. 610,445	56.8
" " shipments	1,854,796	899,720	Inc.. 955,076	106.1
Atlantic ports' receipts	1,370,720	1,378,019	Dec.. 7,299	0.5
Grain of all kinds.				
Lake ports' receipts	3,112,134	3,082,391	Inc.. 29,743	1.0
" " shipments	3,418,308	3,205,311	Inc.. 212,997	6.6
Atlantic ports' receipts	2,418,673	3,531,237	Dec.. 1,112,564	31.5

Of the lake ports' shipments of grain for the week 34.3 per cent. went by rail this year, and 17.4 per cent. in 1875.

For the week ending July 24 receipts at Chicago were 37,302 barrels of flour and 1,985,891 bushels of grain of all kinds, this year, against 26,135 barrels of flour and 1,457,924 bushels of grain of all kinds in 1874. The shipments were 38,369 barrels of flour and 2,235,112 bushels of grain this year, and 22,258 barrels of flour and 1,374,286 bushels of grain last year. The increase in grain was 33 per cent. in receipts and 63 per cent. in shipments.

THE SCRAP HEAP.

British Rail Exports.

The Board of Trade reports the total exports and value of railroad iron of all kinds for June and the first half of the year as follows:

Month of June:	1875.	1874.	Decrease.	P. c
Tons	58,068	92,174	34,086	37.0
Value	£595,735	£1,111,393	£515,655	46.4
Six months:				
Tons	259,307	427,267	167,960	39.3
Value	£2,683,928	£5,494,764	£2,810,836	51.1

The exports to the United States were:

	1875.	1874.	Inc. or Dec.	P. c.
Month of June	1,282 tons	307 tons	Inc.. 973 tons	32.1
Six months	1,474 "	10,930 "	Dec.. 9,455 "	86.5

The total imports of this country were only about enough to lay 16 miles of road. They were, we believe, all steel, and delivered on old contracts. The only countries taking more rails this half-year than during the first half of 1874 are Peru, Chili and Australia, and their aggregate increase is less than 13,000 tons. The largest customers this year are British North America (52,800 tons), Australia (42,000), Russia (31,000), and Sweden and Norway (25,300). Last year the largest customers were Russia (74,000 tons), Spanish West Indies (65,000), Sweden and Norway (40,000), and Australia (38,000).

A Southern Railroad Meeting.

An adjourned meeting was held in Atlanta, Ga., last week to consider the refusal of the East Tennessee, Virginia & Georgia and the South Carolina companies to enter into the pooling arrangement. It is stated the South Carolina claimed that it was never agreed that Charleston business should be pooled. It was decided to cut off the South Carolina from all through contracts and connections as far as possible.

A late telegram from Charleston, however, says:

"All the difficulties between the South Carolina Railroad and connecting roads have been removed, freight and passenger business goes on without interruption."

OLD AND NEW ROADS.

Indianapolis, Peru & Chicago.

This company has recently bought 900 feet of additional dock front at Michigan City, Ind., giving it 1,500 feet in all. The new purchase was needed to give room for the increasing lumber trade of the company.

Albia, Knoxville & Des Moines.

Grading is advancing rapidly, and tracklaying has been begun. The road is to be finished to Bussey, 15 miles from Albia, early in August, and to Knoxville, about 30 miles, by September 1.

Southern of Long Island.

The coroner's jury on the persons killed at the collision near Rockaway, July 5, have brought in a verdict to the effect that "Conductors Holdridge and Hibbard were running their trains on time which did not belong to either of them, according to the rules and regulations of the company, and we hereby severely censure the railroad company in not employing good and competent men or a sufficient number to operate the road safely; also in not having approved brakes attached to the cars, and in altering their time table on a public holiday; also, putting as general manager over the road an inexperienced man, with power to direct and control Superintendent Barton and Train-Master Barr; and we, the undersigned, exonerate Superintendent Barton and Train-Master Barr from all blame."

A minority of the jury exculpated Conductor Holdridge from blame, but concurred in the rest of the verdict.

St. Louis & Southeastern.

A plan of reorganization has been submitted to the agent of the bondholders, and by him transmitted to the bondholders' committee in Europe. It proposes the appointment of a committee which is to supervise the operations of the road and to decide how much of the income shall be applied to improvements or to the payment of debts outside the coupons. The road, however, to remain in possession of the receivers until settlement of the debts subject to the first mortgage shall have been arranged. It is proposed that the net income be applied first to the payment of the coupons or the first mortgage bonds already in default, and afterwards to those which will fall due within five years from May, 1875. The holders of the consolidated bonds and the floating debt creditors to receive for their claims income bonds secured by second mortgage, the interest of which shall be payable only when there is a surplus after paying the first mortgage interest. The first-mortgage bondholders on their part to consent that if by 1880 they shall have received 50 per cent. of all the coupons past due, they will fund the balance in income bonds. If they have not received 50 per cent., then they shall continue to be paid from the net earnings until the 50 per cent. is made up. It is expected that after 1880 full payment of interest will be resumed. It is urged that by this plan the holders of the junior obligations will not be dropped altogether, while the first-mortgage bondholders will receive all the net earnings until their claims are satisfied.

Missouri, Kansas & Texas.

A telegram from Amsterdam, dated the 26th, informs us that this company's proposition for a new arrangement with its bondholders, which was described in our columns two weeks ago, was unanimously adopted at the bondholders' meeting.

Hanover Junction & Susquehanna.

A correspondent informs us that the contract for the construction of this road has been let to James A. Britton & Co., who have from 150 to 200 men at work. The road is to run from Landisville, on the Reading & Columbia road, west to Marietta, and thence southwest to Hanover, its whole length being about 40 miles. About five miles are graded and ready for the iron, part of which is already bought. A mortgage for $1,500,000 has been recorded, of date June 1, 1875. The stock is mainly held by the iron men along the line of the road.

Rockford, Rock Island & St. Louis.

The decree of foreclosure and sale sets forth, as heretofore decided, that the holders of the first series of bonds (1 to 5,000) issued under the mortgage of June 15, 1868, are entitled to the proceeds of the sale of all that part of the road north of a point lying due east of Burlington, Ia., and also to a *pro rata* share of all the rest of the property. As it is held to be best to sell the property in one parcel, it is decided that the property covered by the mortgage of June 15, 1868, is 37 per cent. of the whole. That is, the holders of the bonds numbered 1 to 5,000 will be entitled to 37 per cent. of the proceeds of the sale, and to about five-ninths of the remaining 63 per cent., or to about 72 per cent. of all the proceeds, while the holders of the second series, numbered 5,000 to 9,000, which were issued under the general deed executed October 23, 1868, will receive only their *pro rata* share of the 63 per cent., or about 28 per cent. of the whole. The sale is to be absolute and without redemption. The purchaser must pay $200,000 at the time of sale in cash, the balance to be payable in cash or in bonds and unpaid coupons.

The whole amount due is estimated at $11,251,535.90 in gold, with interest from May 24, 1875, and costs, $6,254,219.28 being due on the first mortgage, and $4,997,316.22 on the second. From the proceeds of the sale the Master is first to pay the Union Trust Company $42,506.95 for costs and expenses, and $8,400 to the attorneys for the intervening bondholders. The Orion & Minersville Railroad Company are to have $29,862.20 for an unpaid balance, and in full of all sums due from the Rockford & Rock Island. About $45,000 is to be paid to various parties in order to place them on an equal footing with the others, these parties not having come in under the provisional contracts of July and October, 1872. The Receiver is to pay over to the Master the net receipts of the road from July 15, up to the date when the new purchaser shall take possession.

The property is described as follows:

A road from Rock Island Junction to Port Byron Junction, 39.4 miles. At Rock Island, 5-12 miles. From Colona to Minersville, 1.4 miles. From Orion to Monmouth, 38.3 miles. Branch road from Rock River Junction to coal mines at Cleveland, 3.5 miles. From Monmouth to Alton Junction, 161.6 miles. A detached road from Keithsburg to Sagetown, which has no connection with any of the other roads, 17.9 miles. A joint interest with the Chicago & Northwestern from Rock Island Junction to Sterling, 5.2 miles. A contract with the Northwestern Railroad Company for the joint use of said road between said points. A right of way from Port Byron Junction to Rock Island. From Orion to Minersville, a distance of 7.6 miles, the company owns right of way, track, and appurtenances (subject to a decree entered in this cause in favor of the Orion & Minersville Railroad). A contract with the Indianapolis & St. Louis Railroad Company, for the use of its road, from Alton Junction to East St. Louis, 21 miles, and certain depot privileges and facilities at East St. Louis. A contract with the Chicago & Rock Island Railroad, for the use of its track, between Colona and Port Byron Junction, and from Port Byron Junction to Rock Island, side tracks, 21.5 miles. All the depots along the line of the Rockford, Rock Island & St. Louis Railroad, excepting at Sterling, Rock Island Junction, Port Byron Junction, Colona, Alexandria, Monmouth, Bushnell, Alton Junction, and the freight depot at Chapin. Car shop, blacksmith shop, machine shop, and round house at Beardstown, together with the tools and machinery in said shops. An engine-house at Rock Island Junction, Sagetown, and Keithsburg. Sundry supplies on hand, averaging $15,000 worth.

The rolling stock consists of 14 first and second class coaches and sleepers, 15 way cars, 6 baggage and mail cars, 391 freight cars, 99 stock cars, 90 flat cars, 317 coal cars, and 20 locomotives. The real estate consists of lots and quarter sections in Henry, Green, Schuyler, Macoupin, and Rock Island Counties.

The court reserves to itself the right, after the sale and the filing of the master's report, to make any modification of the order of distribution named herein, which, upon proper application to it, may seem just and equitable.

The master, Mr. Henry W. Bishop, gives notice that the sale will take place at the Republic Life building, in Chicago, August 10, at 10 a. m.

Alabama & Chattanooga.

The New York correspondent of the *German-American Economist* states the position of the bondholders and the measures practicable for them to take as follows:

1. An arrangement with the State on the basis of $1,000,000 4 per cent. bonds.

2. The acceptance of the road, in which case they must resolve either to pay 8 per cent. interest on the $1,200,000 of outstanding receiver's certificates for eight years to come, or else to pay the whole amount at once, (which they can better afford to do).

3. Provide means for putting the road into good working condition, which will cost at least $500,000.

4. Establish a good, effective administration.

Mr. J. C. Stanton seems to him the man best fitted for managing the road.

Pennsylvania.

Surveys have lately been made of three new lines from Tyrone, Pa., to the Moshannon and Clearfield coal mines. One is by way of Three Spring Run and Spruce Flat, one by way of Sandy Ridge, Trout Run and Houtzdale, and the third by Bear Run and the Moshannon to Osceola. These lines all show much easier grades than the present one. The object of the surveys is not known.

The Convention of Railroad Commissioners.

This convention met in Springfield, Ill., July 20, on invitation of the Missouri Commission. There were present, besides the Illinois Commissioners, Messrs. Mortimer McIlhaney, John Walker and John S. Marmaduke, of Missouri; A. D. Briggs and Francis M. Johnson, of Massachusetts; John F. Tallant, of Iowa; George M. Woodruff, of Connecticut; and George M. Osborne, of Wisconsin. Letters were also received from the Ohio Commissioner. The first session was entirely informal and conversational. The formal meeting began the next morning, John Walker, of Missouri, being chosen Chairman and D. Ray, of Illinois, Secretary.

An extended address was given by Mr. McIlhaney, of Missouri, upon the general status of railroad legislation, urging interference by State authority in cases where roads were to be built too closely parallel, where insufficient business existed, and where no prospect of remuneration could be expected. He also discussed favorably the completion of canals and the improvement of rivers to cheapen transportation rates.

Mr. Osborne, of Wisconsin, next addressed the convention, alluding to the difficulties attending the Potter law and more reasonable laws now in force. He offered several important suggestions in regard to the producing of more harmonious relations between railways and the people.

Mr. Briggs, of Massachusetts, was disposed to disagree with Mr. McIlhaney, and held that railroad transportation might really become as cheap as that by water.

A general discussion followed, and included the policy of Massachusetts in insisting on a true balance sheet from the roads, showing their actual condition, instead of the cooked-up reports so often made.

A committee was appointed to report at the next meeting a proposed law to be passed by Congress for the proper control of inter-State commerce.

The next meeting will probably be held in St. Louis in October.

The meeting of course, could take no action and was mainly for consultation and advice. After adjournment the Commissioners were entertained by the Governor.

Atchison, Topeka & Santa Fe.

The newly-leased Kansas Midland road is being put in repair and made ready for the running of trains. A satisfactory agreement has been made for the use of the St. Louis, Lawrence & Western road from De Soto to Lawrence. Trains will shortly run through to Kansas City.

Union Pacific.

John Duff and Frederick L. Ames, trustees, will receive at their office, No. 38 Sears' Buildings, Boston, up to noon of August 5, proposals for the sale to them of $600,000 of the land-grant bonds, in accordance with the terms of the mortgage.

Northern Pacific.

The Master Commissioners appointed in the Circuit Court of the United States for the Southern District of New York give notice that they will sell at public auction, within the States and Territories in which they may be situated, all such of the lands and land-grants conveyed in the mortgage or deed of trust in the bill of complaint in said action mentioned, as are situated on the completed portions of said road.

The sales will take place at Tacoma, Washington Territory, September 15; at St. Paul, Minn., October 15; at Fargo, Dakota, October 21. The lands will be sold in single sections, but a bidder buying one section may take up 40 others adjoining at the same price. Of the purchase-money 5 per cent must be paid in cash at the time of sale, and the balance in 60 days. First-mortgage bonds which have been approved by the Court will be taken as cash, each bond, however, to be received only for such amount as it would be finally entitled to under the terms of the decree of foreclosure.

No lands will be sold which may have been disposed of by conversion of bonds into land; by any contract for sale thereof, which shall have been approved and countersigned by the receiver appointed in this cause before the date of the sale as herein advertised; or otherwise by sale under orders of the court, before the date of sales advertised.

St. Louis, Kansas City & Northern.

A special meeting of the stockholders will be held in St. Louis, August 10, at 10 a. m., for the purpose of considering the leases of certain connecting lines, which will be presented for ratification, and to consider the purchase of certain rights and franchises, to enable this company to make its connection with the Union Depot, St. Louis.

A Kansas City dispatch says that orders have been given to sell no tickets from any office on the Kansas Pacific which will be good over the Missouri Pacific. The intention is to send all business from the Kansas Pacific over the St. Louis, Kansas City & Northern, in accordance with the agreement recently made between the two companies. To meet this the Missouri Pacific has begun to cut down passenger rates from Kansas

City eastward, and the Hannibal & St. Joseph has done the same. It seems probable that there will be an active "war" for a time.

The Hoosac Tunnel Line.

It is reported that the Hoosac Tunnel Fast Freight line, which is running over the Fitchburg road and through the tunnel, is so organized as to be controlled by the Vanderbilt interest, the New York Central having 225 votes and the Lake Shore 77, or 302 altogether out of a total of 601. It is said that the Fitchburg Company wished to run the cars over the Albany & Susquehanna to a connection with the Erie and possibly the Pennsylvania, but the majority voted against it, and also against admitting the Canada Southern to the line.

The traffic through the tunnel continues small. The arching contractor, Mr. B. N. Farren, who is still in possession of the tunnel, requires a toll of $1.50 for each freight car and $0.75 for each passenger he hauls through. Not much more business can be done until the arching is completed. Much complaint is made by Boston people of the high tolls charged, which it is said, absorb more than the profit on through freight and much more than the *pro rata* share of the tunnel.

Portland & Ogdensburg.

The first passenger train passed through the White Mountain Notch July 27, and ran up as far as Dismal Pool. The connection with the Boston, Concord & Montreal will be completed in about ten days.

Central Vermont.

The Page board of directors has began proceedings in the nature of a *quo warranto* to test the validity of the issue of stock by which the Smith board was elected, and to require that board to show cause why it should not be required to give up possession of the road. The writ is returnable before the Vermont Supreme Court at the August term.

The auditing and settlement of the accounts of the former trustees has been at last begun, at St. Albans, Vt. The special masters, who are to audit the accounts, are Ex-Gov. Paul Dillingham, John L. Edwards and D. C. Dennison. The first session was occupied in discussing the manner in which the work was to be done. The hearing will doubtless take a long time, and will be a very slow and tedious business.

Erie.

Josiah Richards and John Livingston have applied to the New York Supreme Court for an order to set aside the recent election of directors and order a new one to be held. The grounds of the application are alleged irregularities in the conduct of the election and fraud in obtaining proxies.

The new Portage Bridge is rapidly approaching completion. In spite of the recent disastrous fire at the works, the Watson Manufacturing Company has pushed forward the work without delay.

New Jersey Midland.

The bondholders' committee as appointed consists of the Chairman of the recent meeting, Mr. Smith Ely, Jr., and of Daniel B. Halstead, J. Wyman Jones, Francis Leland, New York; John J. Brown, Paterson, N. J.; E. T. Francis, Pittsfield, Mass.; L. E. Olmstead, Norwalk, Conn. Bondholders who have not done so, are requested to send their address and numbers of their bonds to the Secretary, Wm. O. McDonnell, No. 152 Broadway, New York. It is hoped that this committee will be able to present a plan for the reorganization of the road that will be acceptable to all interests concerned.

In a suit for debt the New York Supreme Court has appointed Conrad N. Jordan Receiver of the Midland Terminal & Ferry Company, with power to continue to operate the ferry from Weehawken to Forty-second street, New York. This ferry was included in the purchase of the terminal property at Weehawken.

Atlantic, Mississippi & Ohio.

New iron bridges have recently been erected over Tench Creek, near Big Lick, and over the Holston River at Seven Mile Ford. A new depot is being built at Lynchburg, and 1,000 tons of steel rails have been bought and will be laid at points where the work is heaviest.

Emlenton & Clarion.

This narrow-gauge road is to run from the Allegheny Valley road at Emlenton, Pa., westward to Clarion, about 16 miles. It will serve a section of the Clarion County oil region. The stock has been all subscribed for and the surveys are being made.

Pennsylvania Petroleum.

The sale of this unfinished road has been postponed to September 14.

Columbus & Toledo.

This company is advertising for proposals for the construction of its road, which will be received at its office in Columbus, O., up to August 3.

Rome, Watertown & Ogdensburg.

The track on the Lake Ontario Division is now laid five miles beyond the point last noted. The end of the track is 14 miles west of Charlotte, N. Y.

Pueblo & Arkansas Valley.

The track of this extension of the Atchison, Topeka & Santa Fe road is now laid to a point 30 miles westward from Granada, Col. The distance from Granada to West Las Animas is 54½ miles, and it is expected that track will be laid to the latter point by August 15.

A New Mexican Project.

A recent number of the *Two Republics* says: "Capt. J. M. Mitchell, of Houston, Texas, has arrived in this city with a corps of engineers. The object of his visit to Mexico is for the purpose of securing a concession from this Government for a narrow-gauge railroad from Presidio del Norte to Guaymas. We understand that Capt. Mitchell represents an English company which is at present constructing a railway from Houston, through the center of Texas *via* Lockhart and Fredericksburg to Presidio del Norte."

Wilmington & Reading.

The second-mortgage bondholders have filed a bill in equity in the United States Circuit Court against George Brooke, Abram Gibbons and George Richardson, trustees, to compel them to foreclose the mortgage on said railroad, because said railroad has failed to pay the interest on the bonds since January 1, 1870. The bill charges that more than the required number of bondholders have ordered the trustees to foreclose, but they hesitate to do so. The appointment of a receiver is asked for.

Emmittsburg Branch.

It is proposed to build a branch line about six miles long from the Western Maryland road near Mechanicstown, northward to Emmittsburg.

Lexington & St. Louis.

The Lexington (Mo.) *Intelligencer* says: "Mr. Hamilton, assignee in bankruptcy of the Lexington & St. Louis Railroad, was in the city several days last week, engaged in taking depositions in a case he is prosecuting as assignee against the Pacific Railroad Company. From a hurried conversation with Mr. H., we gathered that he expected to recover from the Pacific Company the market value of the $900,000 second-mortgage bonds issued by what is known as the Morrison board, and turned over to the Pacific Company as part of the consideration for which it agreed to complete, equip and operate the road from Lexington to Sedalia. The assignee also expects to compel the Pacific Company to comply with the provisions of the first contract entered into by it with the Lexington & St. Louis Company, one of which is that the latter is to receive 35 per cent. of the gross annual earnings of the road. This clause was omitted in the second contract, and the Pacific Company took the road on a lease for 30 years, free of rent further than the cost involved in its completion. Suits have likewise been instituted against Ambrose and Green, and probably other individuals, to recover $36,000, that amount in bonds having been placed in the hands of a couple of citizens of Pettis County, to pay for rights of way in that county, but which the assignee alleges was never so expended, or expended at all for the benefit of the road, but was appropriated by members of the Lexington & St. Louis Company, of which Ambrose was President, and Green financial agent, for their own use."

Gulf, Colorado & Santa Fe.

The work on the long pile bridge over Galveston Bay is progressing steadily. All the piles and timber for the bridge are being treated by the creosoting process to secure them from decay and the teredo so destructive to wood in gulf waters. West of the bay the grading is exceedingly light, there being no excavation at all, and no fill over seven feet for 22½ miles. The grading for that distance is nearly done. About 22½ miles from Galveston a tangent begins, which extends to Arcola, 32 miles.

Chicago, Milwaukee & St. Paul.

A meeting of the directors was held in New York last week, when, it is said, the purchase of some additional equipment was authorized, to prepare for the heavy Fall traffic expected.

Quincy & St. Paul.

This company has been trying to raise money in St. Louis to build its projected road, whereupon the *Republican* of that city comments as follows:

"The *Times* of the 24th has a communication or prospectus of the Quincy & St. Paul Railroad, addressed to the President and board of directors of the Merchants' Exchange, asking a loan for the purpose of completing a line of railway from Memphis, Mo., to Albia, Iowa, whereby the merchants of St. Louis will, it is stated, be able to compete for the large trade of Iowa, and at the same time have direct connection with Omaha and St. Paul. This might look like opening a large and new field of trade if we did not know that St. Louis had an old and reliable line to a point in Iowa, connecting directly with three lines at Ottumwa, and indirectly with all the lines of the State. The line referred to is the St. Louis, Kansas City & Northern Railway, which is a St. Louis enterprise, and will work always in that interest. We are expected to believe that the *new* projected line is of great importance to our interests. If any one will look at the map of the State, it will be seen that the proposed line is one that has the interests of St. Louis in view as little as any other point. The territory proposed to occupy has been occupied for years, and the interests of this city have been better looked after than any new line can possibly do. This Quincy & St. Paul Railroad, as a St. Louis enterprise, is simply ridiculous, and for any purpose useless, except as a speculation in construction. The money asked will be forever lost, if given, and nothing in the way of trade gained. The liberality of our merchants in aiding improvements is always extended where St. Louis is to be benefited, but in this enterprise there is nothing to be gained.

"We observe that the directors of the Board of Trade and of the Merchants' Exchange are quoted as indorsing the scheme above referred to, but we are confident that it is without due consideration of the facts."

Chicago & Northwestern.

In answer to some questions in regard to the general consolidated gold bonds, Mr. M. L. Sykes, Jr., Vice-President, has written a letter from which we take the following extracts:

"In reply to your inquiries as to the character and security of the general consolidated gold bonds of this company, I remark that the nominal issue named in the mortgage is $48,000,000, of which amount $35,349,000 are reserved, and can only be issued to retire other bonds by substitution, at the option of the company.

"As there is no occasion or advantage to be derived from substitution, no issue for that object is either contemplated or desired. The total amount of bonds issued is but the residue of the $48,000,000—to wit, $12,651,000; and of these $9,758,000 had been sold up to the beginning of the present fiscal year, June 1, 1875.

"The entire issue of $12,651,000 of gold bonds will increase the debt $12,000 per mile, making a total debt, including the gold bonds, of $31,400,500, on 1,058 miles of railway, being equivalent to $29,700 per mile.

"The actual cost of the property securing the gold bonds is $59,000 per mile.

"The lien of the gold bonds is superior to any obligation or guaranty of the company on the $16,599,500 of the bonds of proprietary roads for which reservation is made in the mortgage, and the entire revenue of the company is pledged under the mortgage to secure the principal and interest of the gold bonds, irrespective of the proprietary lines.

"The net earnings of the company, exclusive of proprietary roads, after paying operating expenses, rent of leased roads, and interest on bonds, including the gold bonds, were $1,366,000 for the fiscal year ending May 31, 1875."

Delaware Shore.

The grading of this new road is nearly finished, and tracklaying has been begun. It is to run from the West Jersey, about five miles below Camden, N. J., southwest through Paulsboro and Pennsgrove to Pennsville, and will be about 27 miles long.

Offers of New Bonds.

The Old Colony Railroad Company is offering for sale through Kidder, Peabody & Co., of Boston, $500,000 of its 20-year 6 per cent. bonds.

M. Bolles & Co., of Boston, are offering $100,000 first-mortgage 6 per cent. bonds of the Nashua & Rochester Railroad, principal and interest guaranteed by the Worcester & Nashua Company.

Hudson Tunnel Railroad.

The Delaware, Lackawanna & Western Company has procured another injunction to prevent this company from continuing work on its tunnel in Jersey City. The case is to be carried up to the Court of Errors and Appeals.

Gilman, Olinton & Springfield.

In the Circuit Court at Bloomington, Ill., July 27, the Special Master in Chancery. M. Prince, made a report upon the petition of Thomas A. Scott and Hugh J. Jewett, trustees in the deeds given to secure the first-mortgage bonds of the Gilman, Clinton & Springfield Railroad; also of the petition of Samuel Thompson and George Barrett, trustees of a mortgage made upon the rolling stock in the spring of 1872. The first petition prays to have the mortgaged premises placed in the hands of the trustees, to be sold upon power of trust deed upon default made in the payment of interest. Upon this basis the Master finds, from the evidence, that the demand for the payment of interest upon the coupons was made according to the provisions of the trust deeds and at the proper time, and in strict accordance with the provision of the trust deed. The holders of more than one-fourth in amount of the deeds made the proper demands in writing on the trustees to act, before the filing of the petition. In regard to the second-named petition, the Master finds that the road owes debts which the mortgage was given to secure, and that the said property was in the hands of a receiver.

Exceptions were filed to the report of the Master by counsel for the defendants, and the case was to be argued in a few days.

Toledo & St. Louis.

The stockholders of this company and the Shelbyville, Oconee & St. Louis have voted to consolidate the two. Neither of them owns any completed road.

Fall River.

The Engineer, Mr. Barney, has completed a survey of a line to connect with the Old Colony Railroad a short distance north of the Bowenville station. The length of the line is 2½ miles, with a grade of 40 feet to a mile.

St. Croix Land Grant.

The United States Court has appointed Willett S. Main, of Madison, Wis., Receiver to collect stumpage and trespass money for all the lands in dispute between the North Wisconsin and the Madison & Portage Company.

Missouri Railroad Law.

The following companies have notified the Railroad Commissioners that they have complied with the law and readjusted their passenger and freight tariffs accordingly: the Chicago & Alton, the Missouri, Iowa & Nebraska, the Quincy, Missouri & Pacific and the St. Louis, Salem & Little Rock. Of these, only the Chicago & Alton has a large traffic, or any important through traffic.

Keithsburg & Eastern.

The Peoria (Ill.) *Transcript* says: "For several years past there has been more or less talk about a narrow-gauge railroad from Keithsburg, on the Mississippi, to some point on the Illinois River. We believe no part of the road has yet been in operation, though some work has been done. Last Saturday a meeting was held at Monmouth to consider the propriety of subscribing to its capital stock. After discussion a committee was appointed to draft resolutions expressing the opinion of the meeting. The committee's report, which was unanimously adopted, concluded as follows:

"'The facts and circumstances developed by this investigation are such that we are reluctantly compelled to report that the Keithsburg & Eastern Narrow Gauge Railway, with its present mortgage and construction contract, presents no inducement to the citizens of Monmouth or Warren County to subscribe to its capital stock in any amount whatever.'"

Havana, Rantoul & Eastern.

It is said that a contract has been concluded with the Milwaukee Iron Company for the rails for a section of this projected road.

St. Joseph & Denver City.

Under the decrees of foreclosure recently granted, Mr. Whitaker M. Grant, Special Master, will sell the property of the company in three separate parcels. The Eastern Division, from Elwood, Kan., to Marysville, 113 miles, will be sold at Marysville, Kan., November 4. At the same time and place will be sold so much of the Western Division as lies in Kansas (about 30 miles) with the land grant in Kansas. The rest of the Western Division, 123 miles, with all the property in Nebraska, will be sold at Steele City, Neb., November 5. The equipment and personal property will be divided between the three sections in proportion to their length. The sale will be at public auction and will be absolute.

Joliet & Northern Indiana.

It will be remembered that the principal of the first mortgage bonds of this road became due some time since, and that the lessee, the Michigan Central, offered to issue new 6 per cent. bonds in place of the old bonds, which bore 8 per cent. interest. Nearly all the stock was held by the lessee. The rental paid for the road has been $89,000 per year, of which $64,000 was applied to the payment of interest, and the remainder generally used to pay dividends on the stock. The lease was perpetual but did not provide for the payment of the principal of the bonds. The bondholders declined to receive the new bonds, and the trustee brought suit for relief. The United States Circuit Court has now made an order appointing Henry F. Eames, of Chicago, receiver for the purpose of collecting the rental. He is ordered to collect it from the lessee, to pay the interest on the old bonds, and to apply the balance to the reduction of the bonded debt. The bondholders do not desire a foreclosure, as the road by itself is unprofitable, and moreover, has no equipment. The Court, in its opinion, questioned seriously whether it had not been a breach of faith on the part of the lessee to use the balance of the rental in paying dividends instead of reducing the debt.

Paducah & Memphis.

Philo C. Calhoun and Lewis C. Meyers, trustees, have begun suit to foreclose the first mortgage on this road in the United States Circuit Court. There are about $2,805,000 of the bonds outstanding, and interest has been in default over a year. By the terms of the mortgage the principal is held to be due whenever interest shall be unpaid more than six months. The road is completed from Paducah, Ky., south by west to Trimble, Tenn., 78 miles, and from Memphis, Tenn., northwest to Covington, 37 miles. A little work has been done on the gap between Covington and Trimble.

Great Western Telegraph.

An end is apparently approaching to the long litigation in which this company has been involved. The Cook County Circuit Court has ordered Mr. O. H. Horton, the Receiver, to sell the property at auction, October 1. The order was made on representations of the Receiver that the lines could not be operated in their present condition without a loss.

Chicago, Danville & Vincennes.

Application was lately made to the United States Circuit Court to allow the two foreclosure suits, that brought by Mr. Osgood and that begun by Fosdick and Fisk, the trustees, to be consolidated. The Court, after hearing arguments, refused to grant the petition, but gave leave to the plaintiff in the Osgood suit to file an intervening petition, in the other case.

The Green Line Railroad War.

The Louisville & Nashville Company, having refused to take through tickets to points south of Nashville issued by the St. Louis & Southeastern since that company cut down the fares between St. Louis and Louisville, the Southeastern now sells tickets between Nashville and Louisville at one-third the regular fare, and takes freight at corresponding rates. The route is by the Southeastern from Nashville to Nortonville, Ky., and thence by the Louisville, Paducah & Southwestern. The distance between the two cities by this route is 245 miles, or 60 miles more than by the Louisville & Nashville.

Boston, Hartford & Erie.

On petition of the assignees in bankruptcy of this company for leave to sell and convey certain property, and to settle and compound certain controversies, Judge Fox has issued a decree authorizing the assignees to forthwith deliver to the New York & New England Railroad Company a deed releasing to grantees the property described, and settling the various controversies in the manner and upon terms set forth. The assignees shall

collect and receive from the grantees the sum of $100,000 as consideration money therefor. An amendment referred to provides that the release and conveyance shall not affect or impair any right, title, or interest, if such there be, of any stockholder or creditor of the Hartford, Providence & Fishkill Railroad Company, or of any other party having any claim or rights superior to the rights belonging to, or vested in, said assignees in bankruptcy.

Delaware, Lackawanna & Western—Morris & Essex Division.

A new iron bridge is to be built across the Passaic River at Newark, N. J., and the contract therefor has been let to the Delaware Bridge Company. The new bridge will probably be located a little below the old one, which will allow the curves on each side of the river to be reduced somewhat. The location of the new bridge there, however, indicates that the idea of building a new line through Newark has been given up, and that only slight changes will be made. The new bridge will be double track, and probably the same height as the present one, which is about 40 feet above the river. The old bridge, which has stood for many years, is a pile bridge, with a Howe-truss draw.

Work is progressing steadily on the new tunnel through Bergen Hill. The new line west of the hill has nearly reached the Hackensack River and the piers and abutments for the bridge over that stream are going up. The new line for the Boonton Branch west of the tunnel is also well under way.

Springfield & New London.

Work is in progress all along the line from Springfield, Mass., to the Connecticut State line, the contractors, Binnie & Warren, having a large force employed.

North Brookfield Branch.

The contract for building this road has been awarded to George W. Cram, of Norwalk, Conn., he agreeing to have it completed by November 15. The price is $61,500, and the contract includes everything needed to put the road in order for business, except engineering expenses, a water-tank and the passenger depot at North Brookfield. The contractor has already begun work. The road will be 4¼ miles long, from the Boston & Albany at East Brookfield to North Brookfield village. As at present located there is one grade of 116 feet to the mile, but it is thought that this can be cut down to 105 feet. Only one bridge will be required. The land damages will be about $12,000, and it is expected that there will be enough left of the town subscription of $90,000 to buy the equipment needed.

Boston & Albany.

The Springfield *Republican* says: "For over a year the Boston & Albany Railroad Company have been making a series of improvements in their road at Russell, the main object of which has been to avoid crossing the Westfield River there twice, as well as a smaller stream about 100 feet wide, by laying the track upon the east side of the river, connecting with the village by a passenger bridge at the foot of Main street. The work has involved the laying of 8,370 feet of track, which is little if any shorter than the old route, and a large portion of this has been through rock, necessitating considerable cutting and blasting. A neat passenger depot of brick has been built, and just north of it an iron passenger bridge of two spans, each 125 feet long, has been thrown across the river, the road reaching which will run over the site of the old wood-shed and freight-house. The work will be completed within a fortnight, so far as to allow the use of the new track."

Long Branch & Sea Girt.

Work has been begun with a large force on this extension of the New York & Long Branch road southward along the shore.

Boston & New York Air Line.

At a special meeting in Middletown, Conn., July 23, the stockholders voted to issue $500,000 7 per cent. bonds having 20 years to run, and secured by a first mortgage on the entire property, on which there is now no other mortgage lien, all the old ones having been extinguished by the foreclosure. Stockholders are to have the first opportunity to take these bonds, and those desiring to do so must make application by August 15 to the Treasurer, Mr. D. B. Hatch, at his office, No. 12 Wall street, New York.

Pound Gap.

The new board of directors has approved the line as surveyed from the Kentucky Central at Falmouth, east by south through Pendleton, Bracken, Mason and Fleming counties to Flemingsburg. This line runs by way of Wagner's Ferry, Brooksville and Germantown.

Evansville, Owensboro & Nashville.

On application of a number of the creditors, the United States District Court at Louisville, Ky., has declared this company bankrupt. Mr. R. S. Triplett, of Owensboro, Ky., has been appointed Receiver until an assignee can be chosen by the creditors. A meeting for that purpose will be held August 10.

Knoxville & Charleston.

A new company has been organized, and efforts are to be made to secure means for the extension of the road southeastward.

Washington & Ohio.

A proposition has been made by certain parties to advance the money to complete the road to Winchester, Va., and to extend it 23 miles beyond that point to the coal fields of Hampshire County, provided they can have the control of the expenditure and that their representative, Mr. Oscar A. Stevens, be appointed Vice-President and General Manager. It is understood that the board of directors has agreed to the terms.

Bachman Valley.

There is talk of extending this road westward from the present terminus at the Chestnut Hill Ore Bank, and surveys are to be made at once. The extension will be in Maryland, and will run nearly parallel with the Pennsylvania State line to the crossing of the Frederick & Pennsylvania line road, and probably beyond.

Utica, Ithaca & Elmira.

The track is now laid to Candor, N. Y., six miles beyond the old terminus at Wilseyville, and 13 miles from the intersection of the Geneva, Ithaca & Athens at Van Ettenville. Trains are running through from Woodford's Station, in Candor, to Elmira. Work is progressing steadily on the line from that point to Ithaca.

Chicago, Clinton & Western.

The track is laid from Clinton, Ia., west by south 15 miles to the Wapsie River, and the bridge over that stream was to be finished this week. West of the river three miles are graded, and men are at work on the next two. Beyond this last section grading has been in progress some time. It is expected to reach the crossing of the Maquoketa Branch of the Davenport & St. Paul in August, when a regular train will be run. A large quantity of iron and 50,000 ties are on hand at Clinton.

Philadelphia & Reading.

President Gowen has made a long address before the Investigating Committee of the Pennsylvania Legislature in answer to the complaints made by certain retail coal dealers of Philadelphia. He brings evidence to prove that the company has always given full and even over-weight to its customers; that cases of delay in delivering cars are of very rare occurrence; that cars consigned to individual dealers are always given the preference over those belonging to the Philadelphia & Reading Coal and Iron Company. He then turned upon the dealers and produced further proof that some of them, who had been loudest in their complaints, had been guilty of giving very short weight to their customers, a ton bought at a retail yard in one instance weighing only 1,713 pounds instead of 2,240, and many other instances of short weight having been detected.

New Mail Routes.

Mail service has been ordered over the following new lines:

Marietta & Cincinnati (Baltimore Short Line), from Athens, O., to Parkersburg, W. Va., 30 miles.

Utica, Ithaca & Elmira, Van Ettenville, N. Y., to Candor, 13 miles.

Utica & Black River.

Meetings have been held and a committee appointed to confer with the officers of this company, to see what steps can be taken toward building a branch or extension from Morristown, N. Y., northeast to Ogdensburg of the road now under construction from Philadelphia to Morristown. It is thought that the Black River Company will agree to guarantee a reasonable amount of bonds.

Ohio & Toledo.

The old part of the road, from Carrollton, O., to Oneida, is being ballasted, and the grading of the extension from Minerva to Bayard is progressing. A new passenger train has been put on the road.

Galveston, Harrisburg & San Antonio.

The track is laid and regular trains are running to Kingsbury, Tex., 11¼ miles westward from the late terminus at Luling, and 166¼ miles from the eastern terminus at Harrisburg.

Utah Northern.

The location of the road from Franklin, Idaho, northward, is in progress. A contract has been let to a Mr. Thurston, of New York, for the grading to Bear River, 10 miles, including the bridge over Cub River at Franklin, which will be 2,100 feet long, and 22 feet above the water.

Susanville & Reno.

It is proposed to build a railroad about 90 miles long from Susanville in Lassen County, Cal., south by east to the Central Pacific at Reno, Nev. The road would run through an agricultural and grazing region.

Amador Branch.

This company has filed its certificate of incorporation with the Secretary of State of California. The road is to run from the Central Pacific at Galt, Cal., eastward to Ione in Amador County, about 27 miles. The capital stock will be $675,000. The corporators are all parties connected with the Central Pacific.

Palisade & Eureka.

A large force of Chinese is at work on the grading south of Alpha, Nev., the present terminus. The heaviest work on the line is there encountered.

Danville & New River.

The incorporators met at Martinsville, Va., July 13, and, after completing the organization of the company, appointed several committees to secure subscriptions to the stock. It is proposed to build at once the section from Danville west to Martinsville, about 30 miles. The road is to be of 3 feet gauge.

ANNUAL REPORTS.

Boston, Concord & Montreal.

This company owns and works a line from Concord, N. H., north by west to Woodville and thence northeast to Groveton Junction, on the Grand Trunk, 145 miles, with a branch from Wing Road to Fabyan Place, 15 miles. Six miles of the branch were not opened for travel till July, being worked only nine months of the fiscal year.

At the close of the year, March 31, the equipment consisted of 26 engines in use besides two under construction; 23 passenger, 2 drawing room, 13 mail and baggage cars; 595 freight cars of all classes. It was increased during the year by 2 engines, 1 passenger, 2 smoking and 2 baggage cars; 12 freight and 1 saloon car and 1 "gouger" (whatever that may be).

The property is represented as follows:

Preferred stock	$800,000
Common stock	1,000,000
Total stock ($11,250 per mile)	$1,800,000
Bonded debt ($13,431 per mile)	2,148,900
Total ($24,681 per mile)	$3,948,900

During the year $132,500 consolidated bonds have been sold. The cost of the Y at Woodville, the Fabyan Branch and the Groveton Extension, with other improvements, has been about $1,440,000, of which $790,000 have been charged to the Extension account, leaving $650,000 to be added hereafter, as sales of consolidated bonds are made. The Trustees of the Sinking Fund hold $306,000 of bonds.

Enough of the old stock has not yet been returned to warrant the issue of the new consolidated stock, as it is desirable that none of the new should be issued until the old is all in.

The Fabyan branch has proved a valuable feeder. The charter provides for its extension to the foot of Mount Washington, and it may be desirable to build some of it this year.

The report says: "On the tenth day of March a lease for one year of its road and equipment was executed by the Southeastern Counties Railway of Canada to the Connecticut & Passumpsic Rivers Railroad. A supplementary contract has since been entered into between the latter railroad and this corporation, by which the benefits and responsibilities of the lease are to be shared equally by the two corporations. This contract will tend to the efficient and economical management of connecting business, and a considerable increase of business is confidently expected."

The earnings of the road for the year ending March 31 were as follows:

	1874–75.	1873–74.	Inc. or Dec.	P. c.
Passengers	$264,862 07	$236,020 44	Inc.. $28,841 63	12.2
Freight	371,553 45	424,576 11	Dec.. 53,022 66	12.4
Express, mail, etc.	27,778 86	26,532 01	Inc.. 1,246 85	4.7
Total	$664,194 38	$687,128 56	Dec.. $22,934 18	3.3
Working expenses	523,985 75	550,981 20	Dec.. 26,995 45	4.9
Net earnings	$140,208 63	$136,147 36	Inc.. $4,061 27	3.0
Gross earn'gs per mile	4,190 50	4,520 58	Dec.. 330 08	7.3
Net earnings per mile.	845 97	895 71	Dec.. 49 74	5.5
Per cent. of expenses.	78.89	80.17	Dec.. 1.28	....

The decrease in gross earnings is 3.3 per cent.; in expenses, 4.9 per cent.; the increase in net earnings, 3.0 per cent.

The work done was as follows:

	1874–75.	1873–74.	Inc. or Dec.
Train mileage	624,271	523,362	Inc..100,909
Passengers carried	187,260	174,926	Inc.. 12,334
Passenger mileage	11,235,600	10,495,530	Inc..740,070
Tons freight moved	88,671⅛	99,909⅛	Dec.. 11,238
Tonnage mileage	5,320,320	5,994,940	Dec..674,620

The decrease in tonnage mileage was 11.3 per cent., and the increase in passenger mileage 7.1 per cent.

The payments for interest were $136,190.27, and for dividends on preferred stock $48,804. The balance of cash and bonds on hands was $173,050.99 at the beginning of the year, and $141,956.58 at its close.

During the year 92,944 new ties were put in, 1,205 tons of new 56-lb. iron were laid, and 440 tons of light iron taken from the main line and laid on the branch. A new bridge, new abutments for two others, two new wood sheds and 32 miles of fence were built. About 16⅛ miles of sidings have been laid.

Northeastern.

This company owns and works a railroad from Charleston, S. C., northward to Florence, 102 miles. It is a part of the Coast line from Charleston northward to Wilmington, Richmond and the North, but much of the country along the line is thinly inhabited and not very productive.

The equipment of the road consists of 14 engines; 14 passenger and 5 mail and baggage cars; 87 box and 54 platform cars. Of the engine and passenger cars several are old and light and must soon be replaced, and more freight cars are needed.

At the close of the last fiscal year, February 28, the capital account was as follows, compared with the previous year:

	1875.	1874.	Inc. or Dec.
Common stock	$899,350	$899,350	
Preferred stock	96,000	96,000	
Total stock	$995,350	$995,350	
First mortgage bonds	820,000	820,000	
Second " "	226,000	226,000	
Old second lien bonds	3,500	3,500	
Real estate bonds	28,000	28,000	
Total bonded debt	$1,077,500	$1,077,500	
Bills payable	41,000	89,850	Dec. $48,850
Certificates of indebtedness	102,753	109,028	Dec. 6,275
Interest outstanding	6,542	4,549	Inc. 1,993
Floating debt	$150,295	$203,427	Dec. $53,132
Total	$2,223,145	$2,276,277	Dec. $53,132

The stock is $9,758, and the bonds $10,564 per mile. There are also $96,000 additional second-mortgage bonds, which are held by the trustee as security for the preferred stock, and which are exchangeable for that stock at the option of holders.

The certificates of indebtedness were due January 1, 1875, but being unable to pay on account of the large amount of taxes required to be paid owing to the decision of the United States Supreme Court that the company was subject to taxation, and to other extra expenses, the company offered to exchange them for new 8 per cent. certificates, having 10 years to run, 10 per cent of the principal payable every year. The amount exchanged was $38,850 up to date of the report.

The earnings of the road for the year were as follows:

	1874–75.	1873–74.	Inc. or Dec.	P. c.
Freight	$292,348 76	$270,516 39	Inc. $21,832 37	8.1
Passengers	107,335 54	116,624 01	Dec. 9,288 47	8.0
Mails and other sources	17,271 76	16,710 77	Inc. 560 99	3.4
Total	$416,956 06	$403,851 17	Inc. $13,104 89	3.2
Working expenses	241,514 46	258,635 40	Dec. 17,120 94	6.6
Net earnings	$175,441 60	$145,215 77	Inc. $30,225 83	20.8
Gross earnings per mile	4,087 80	3,959 33	Inc. 128 47	3.2
Net earnings per mile.	1,720 02	1,423 68	Inc. 296 34	20.9
Per cent. of expenses.	57.94	64.04	Dec. 6.10	9.5

The increase in earnings is mainly in through freight, and is due mainly to closer connections.

The partial statement of the work done is as follows:

	1874-75.	1873-74.	Increase.
Train mileage	297,181	.....	.....
Bales cotton carried	77,836	56,976	20,860
Barrels naval stores	115,299	108,718	6,581

The average cost of engine service was 16.35 cents per mile.

The income account is as follows:

Net earnings		$175,441.60
Debit balance from 1874	$10,574.08	
Old accounts	3,503.59	
Back taxes	31,249.24	
Interest	108,478.66	
		153,805.52
Balance to next year		$21,636.08

The road has been kept in good repair, and the Santee Bridge has been almost entirely renewed.

Columbus & Hocking Valley.

This company owns and works a line from Columbus, O., southeast to Athens, 76 miles, with a branch from Logan to New Straitsville, 13 miles, making 89 miles in all. It was built to carry the traffic of a coal and iron region, and has been one of the most prosperous of the newer Ohio roads.

At the close of the last two fiscal years, December 31, the property was represented as follows:

	1874.	1873.	Increase.
Stock	$1,855,250	$1,854,450	$800
Funded debt	2,456,000	2,299,000	157,000
Totals	$4,311,250	$4,153,450	$157,800

The stock is $20,846 and the bonds $27,595 per mile. The annual interest charge is $171,920, or $1,932 per mile.

The earnings for the year were as follows:

	1874.	1873.	Inc. or Dec.	P. c.
Passenger	$120,034 18	$118,203 65	Inc. $1,830 53	1.5
Freight	579,654 35	938,569 26	Dec. 358,904 91	38.2
Express, mail, etc...	17,792 03	17,414 46	Inc. 377 57	2.2
Total	$717,490 56	$1,074,187 37	Dec. $356,696 81	33.2
Expenses	360,413 38	698,027 78	Dec. 337,614 40	48.4
Net earnings	$357,077 18	$376,159 59	Dec. $19,082 41	5.0
Gross earnings per mile	8,061 69	12,070 00	Dec. 4,008 31	....
Net earn's per mile,	4,012 10	4,227 00	Dec. 214 90	....
Per ct. of expenses..	50.20	64.98	Dec. 14.78	....

The very heavy decrease in freight earnings is the result of a stoppage of coal traffic for three months by strikes and the general dullness of coal business through the year. The decrease in expenses is largely due to the fact that the road suffered comparatively little damage from freshets or storms.

The income account of the year was as follows:

Balance from 1873		$183,224 19
Net earnings, 1874		357,077 18
Total		$540,301 37
Interest	$172,789 07	
Dividends (8 per cent.)	148,416 00	
		321,205 07
Balance to 1875		$219,096 30

The work done was as follows:

	1874.	1873.	Inc. or Dec.
Locomotive mileage	502,868	668,306	Dec.. 165,438
Passenger car mileage	326,404	302,461	Inc.. 23,943
Freight " "	5,557,282	8,903,478	Dec.. 3,346,196
Passengers carried	159,990	153,745	Inc.. 6,245
Tons freight "	568,022	890,396	Dec.. 322,374
Tonnage mileage	33,219,340	52,970,420	Dec 19,751,080

The average rate per ton per mile was 1.74 cents against 1.77 in 1873. Of the whole tonnage 85.4 per cent. was coal in 1874, against 90.64 per cent. the previous year.

The equipment was increased by two locomotives, and con-

sists of 31 locomotives; 8 passenger, 1 combination and 3 baggage cars; 100 box, 100 platform, 1,000 eight-wheel coal and 13 caboose cars. There are also on the road 808 eight-wheel and 100 four-wheel coal cars belonging to coal operators.

The remaining masonry required between Columbus and Carroll has been completed for double track, and all trestle work between same points has been filled with earth. Two iron bridges (one over the canal at Carroll and one over the Hocking River at Logan) have been placed on the road. Three additional side tracks have been built—one of 2,800 feet at Lockville, one of 1,300 feet at Millville, and one of 1,650 feet at Athens. The long trestle at Lancaster has been filled with earth, making in all 1,650 feet of trestle filled during the year. Extensive renewals of ties, rails and ballast are needed during the current year, and 1,200 tons of steel rails have been contracted for.

Michigan Central.

This company's property consists of the 284 miles of railroad between Detroit and Chicago, with its equipment and the equipment with which it works 519.72 miles of leased branches, $4,598,450 invested in the improvement of the leased branches, which forms a debt of the lessor companies, $445,000 of the stock of branches, about $100,000 in the bonds of companies to which it made a contract for a "traffic guarantee," and $164,000 advanced to the Detroit & Bay City Railroad. Very few of the assets mentioned below equipment have much marketable value, or are valuable to the Michigan Central Company otherwise than in strengthening its control of various connecting roads. They virtually give it ownership of most of its leased lines, however. The equipment consisted at the end of the fiscal year ending with May last of 211 locomotives, 74 12-wheeled and 9 8-wheeled passenger coaches, 30 12-wheeled and 8 8-wheeled second-class passenger cars, 2 12-wheeled combined passenger and baggage, 3 12-wheeled postal, 17 12-wheeled and 17 8-wheeled baggage and mail cars, 1 officers' and 1 pay car, 99 conductors' cars, 462 stock, and 500 stock "combination" cars, 1,828 box, 710 Blue Line, 21 refrigerator, 1,308 platform cars, 2 derrick and 2 pile-driving cars. The changes within the year were the addition of one first-class 8-wheeled coach, one officers', one pay and the two combined passenger and baggage cars; of 3 conductors', 500 combination stock and 236 Blue Line cars; and decrease of two second-class passenger, and three baggage and mail cars; of 31 stock, 15 box and 24 platform cars.

The capital account is as follows:

	1875.	1874.	Increase.	P. c.
Stock	$18,738,204	$18,738,204	....	..
Funded debt	11,335,000	10,735,000	$600,000	5.6
Guaranteed funded debt of leased lines	8,987,000	8,987,000	....	..

The company at the close of the last year owed a floating debt of $770,000, against one of $1,056,000 the year previous.

In the company's sinking fund is $672,000 of its own bonds, reducing the funded debt payable by that amount. The two sinking funds contain together securities (nearly all bonds) having the par value of $1,716,719.57; of these $285,000 is of bonds now in default.

The stock per mile of road owned is $65,945; the debt secured by mortgage on the company's property is $39,915 per mile owned; the guaranteed bonds of leased lines are $31,658 per mile of road owned. As a whole, at present the leased lines are not profitable, and two-thirds of the burden of the whole amount of interest falls on the profits of the main line. Taking the whole mileage leased and owned, and in addition that of the Detroit & Bay City, whose bonds are guaranteed and stock controlled by the Michigan Central, and the average amount of funded debt per mile of road is $22,213 per mile.

The bonds bear 8 and 7 per cent. interest. The total payments on interest account during the last year amounted to $1,594,415, which is at the rate of $5,614 per mile of main line and road owned, or $1,735 per mile of road mortgaged to secure the whole amount of bonds.

The work of the year, reported only for the 387 miles of Main and Air Line, was:

	1874–75.	1873–74.	Inc. or Dec.	P. c.
Train mileage—				
Passenger	1,028,171	1,076,225	Dec.. 48,054	4.5
Freight	2,390,323	2,406,888	Dec.. 16,565	0.7
Service	1,597,121	1,632,862	Dec.. 35,741	2.2
Passengers carried	831,489	877,445½	Dec.. 45,956½	5.2
Passengers carried one mile	72,826,047	Not reported.	.....	..
Tons carried	1,641,280	1,593,954	Inc .. 47,326	3.0
Tons carried one mile	318,366,003	313,401,088	Inc ..4,964,915	1.6

The changes above are all slight. The decrease in passenger-train mileage and in passengers carried are almost the same. The very slight decrease in freight-train mileage coincides with an increase of 1.6 per cent. in tons carried one mile. The amount of traffic may be considered nearly identical with that carried the previous year, the slight loss in passengers being just about balanced by the slight gain in freight, which latter, in view of the great depression in business and the small shipments of grain, is noticeable, and was made up entirely by an increase of shipments westward.

On this part of the road, that is the 284 miles of Main Line, and the 103 miles of Air Line, whose chief use is as a second track for the Main Line, the earnings and expenses were as follows:

Earnings:	1875.	1874.	Inc. or Dec.	P.c.
Passengers	$1,793,727.66	$1,803,247.66	Dec.... $9,520.00	0.5
Freight	3,692,267.01	4,086,785.12 "	...394,518.11	9.6
Other	295,943.10	306,683.29 "	... 10,740.19	3.5
Total	$5,781,937.77	$6,196,716.07	Dec.. $414,778.30	6.7
Expenses:				
Working expenses	$3,684,998.03	$4,055,594.05	Dec.. $370,596.02	9.1
Taxes	177,815.55	164,361.09	Inc .. 13,454.46	8.2
Total	$3,862,813.58	$4,219,955.14	Dec .. $357,141.56	8.5
Ratio of expenses to earnings:				
With taxes	66.80 per cent.	68.10 per cent.	Dec. 1.30 per cent.	
Without taxes	63.73 "	65.45 "	Dec. 1.72 "	
Net earnings	$1,919,124.19	$1,976,760.93	Dec.. $57,636.74	2.9

Here, though there is a large decrease in freight earnings, it is so nearly balanced by a decrease in working expenses that the falling off in profits is less than $60,000 and 3 per cent.

Movement of Passengers, Through and Local, and Earnings on same, for the Year ending May 31, 1875.

	Passengers carried.	Passengers carried one mile.	Earnings.	Earnings per passenger per mile.
Through East	75,180	21,347,830	$505,421 06	2.36 cts.
Through West	87,408	24,820,499	408,185 66	2.00 "
Total through	162,588	46,168,329	$1,003,606 72	2.17 cts.
Local East	335,836	13,512,038	$400,482 21	2.96 cts.
Local West	333,065	13,145,679	389,638 73	2.96 "
Total local	668,901	26,657,717	$790,120 94	2.96 cts.
Total East	411,016	34,859,868	$905,903 27	2.60 cts.
Total West	420,473	37,966,178	887,824 39	2.34 "
Grand total	831 489	72,826,047	$1,793,727 66	2.40 cts.

Movement of Freight, Through and Local, and Earnings on same, for the Year ending May 31, 1875.

	Tons carried.	Tons carried one mile.	Earnings.	Earnings per ton per mile.
Through East	752,650	208,088,330	$1,830,324 89	0.89 cts.
Through West	205,395	57,466,488	584,645 55	1.02 "
Total through	958,045	263,554,818	$2,414,970 44	0.92 cts.
Local East	382,084	31,937,524	$737,237 32	2.30 cts.
Local West	301,151	22,873,661	540,059 25	2.36 "
Total local	683,235	54,811,185	$1,277,290 57	2.33 cts.
Total East	1,134,734	238,025,854	$2,567,562 21	1.08 cts.
Total West	506,546	80,340,149	1,124,704 80	1.40 "
Grand total	1,641,280	318,366,003	$3,692,267 01	1.16 cts.

Compared with the previous year there was a decrease of 7 per cent. in tonnage mileage through eastward, an increase of 44 per cent. through westward, an increase of 0.9 per cent. in total through tonnage mileage, an increase of 2 per cent. in local eastward, of 10 per cent. in local westward, and of 5 per cent. in total local; a decrease of 6 per cent. in the total eastward, and an increase of 33 per cent. in the total westward.

For the entire system worked, 803.72 miles, the earnings and expenses were:

Earnings:—	1875.	1874.	Inc. or Dec.	P.c.
Passengers	$2,318,998 66	$2,360,948 86	Dec. $41,950 20	1.8
Freight	4,447,838 69	4,918,961 93 "	471,123 24	9.6
Other	335,449 06	354,170 91 "	18,721 85	5.3
Total	$7,102,286 41	$7,634,081 70	Dec. $531,795 29	6.96
Expenses:—				
Working exp	$4,847,724 20	$5,316,549 64	Dec. $468,825 44	8.8
Taxes	220,373 56	207,092 75	Inc. 13,280 81	6.4
Total	$5,068,097 76	$5,523,642 39	Dec. $455,544 63	8.2
Ratio of Expenses to Earnings:—				
With taxes	71.35 per cent.	72.35 per cent.	Dec. 1.00 per cent.	
Without taxes	68.25 "	69.64 "	" 1.39 "	
Net earnings	$2,034,188 65	$2,110,439 31	Dec. $76,250 66	3.6

The treasurer's statement is as follows:

	1874–75.		1873–74.	
Gross receipts		$6,720,013 45		$7,665,372 66
Expenditures:—				
Working exp.	$5,068,097 76	$5,523,642 39		
Interest	1,594,414 53	1,284,432 30		
		6,662,512 29		6,808,074 59
Surplus		$57,501 16		$857,298 07

These statements of the gross receipts do not agree with those of other parts of the road for either year, but the working expenses are the same, and the result probably is made to show what was left in the treasury, after paying rentals as well as interest.

Separate statements of earnings, expenses, net earnings or deficits, rentals and result of working under lease are given below for each leased branch:

	1875.	1874.	Inc. or Dec.	P. c.
Joliet Division:—				
Earnings	$127,711 86	$165,166 42	Dec.. $37,454 56	22.5
Expenses	171,324 09	183,494 55	Dec.. 12,170 46	6.6
Deficit	$43,612 23	$18,328 13	Inc.. $25,284 10	13.8
Rental	74,468 00	74,468 00	.....	....
Net loss	$118,080 23	$92,796 13	Inc.. $25,284 10	27.2
Grand River Valley:—				
Earnings	$293,528 20	$296,981 23	Dec.. $3,453 03	1.2
Expenses	216,735 68	200,772 44	Inc.. 15,963 24	7.9
Net earnings	$76,792 52	$96,208 79	Dec..$19,416 27	20.2
Rental	144,560 00	144,560 00	.....	....
Net loss	$67,767 48	$48,351 21	Inc..$19,416 27	40.4
Kalamazoo & South Haven:—				
Earnings	$67,064 64	$80,832 03	Dec..$13,767 39	17.0
Expenses	47,583 27	42,435 16	Inc.. 5,148 11	12.1
Net earnings	$19,481 37	$38,396 87	Dec..$18,915 50	49.2
Rental	56,800 00	56,800 00	.....	....
Net loss	$37,318 63	$18,403 13	Inc..$18,915 50	103.0
Nunica:—				
Earnings	$34,080 22	$37,150 99	Dec.. $3,070 77	....
Expenses	66,030 57	48,773 11	Inc.. 17,257 46	....
Deficit	$31,950 35	$11,622 12	Inc..$20,328 23	....
South Bend:—				
Earnings	$18,434 74	$20,949 09	Dec.. $2,514 35	12.0
Expenses	15,999 13	11,631 68	Inc.. 4,367 45	37.6
Net earnings	$2,435 61	$9,317 41	Dec.. $6,881 80	74.0
Rental	16,000 00	16,000 00	.....	....
Net loss	$13,564 39	$6,682 59	Inc.. $6,881 80	103.0
Jackson, Lansing & Saginaw:—				
Earnings	$658,286 80	$720,213 71	Dec..$61,926 82	8.6
Expenses	409,655 84	556,749 29	Dec..147,093 45	26.6
Net earnings	$248,631 05	$163,464 42	Inc..$85,166 63	52.1
Rental	410,990 00	410,990 00	.....	....
Net loss	$162,358 95	$247,525 58	Dec..$85,166 63	34.3

TOTAL LEASED BRANCHES, THE AIR LINE EXCEPTED.

	1875.	1874.	Inc. or Dec.	P. c.
Earnings	$1,199,106.55	$1,321,293.47	Dec.. $122,186.92	9.2
Expenses	927,328.58	1,043,856.23	Dec.. 116,527.65	11.2
Net earnings	$271,777.97	$277,437.24	Dec.. $5,659.27	2.0
Rentals	702,818.00	702,818.00	.....	...
Net loss	$430,040.03	$425,380.76	Inc.. $4,659.27	1.1

Thus a decrease of earnings and a considerable increase in expenses characterizes every leased line except the Jackson, Lansing & Saginaw, which latter, though having a decrease of earnings amounting to 8⅓ per cent., has got double its net earnings by a great decrease in expenses, and this makes the net result of the working of the leased branches very nearly the same as last year.

The direct loss of $430,000 incurred by working these branches under the leases is equal to just about 2½ per cent. on the company's capital stock. Against this loss should be set the net earnings on that traffic which they contribute to the main line, which this company would not get otherwise.

Taking the whole system together, the earnings and expenses were:

	1875.	1874.		P. c.
Earnings per mile	$8,836	$9,498	Dec.. $662	7.0
Expenses per mile	6,306	6,875	Dec.. 569	8.2
Net earnings per mile	2,530	2,623	Dec.. 93	3.6

The details of expenses, to which we have added the proportion of each item to the whole, were as follows for the Main and Air lines:

DETAILS OF WORKING EXPENSES.

EXPENDED FOR	1874.	1875.	Percentage of all expenses. 1874.	1875.
Road repairs	$263,571 40	$375,838 45	6.24	9.73
Building repairs	151,593 70	96,455 62	3.59	2.49
Locomotive repairs	230,368 39	232,308 97	5.46	6.01
Car repairs	619,061 06	353,557 64	14.67	19.14
Locomotive service	250,174 10	281,126 02	5.93	7.27
Train service	253,991 83	262,492 09	6.02	6.80
Station service	993,024 71	942,857 65	23.53	24.46
Fuel	754,592 09	581,109 61	17.88	15.04
Oil and waste	103,904 46	67,231 21	2.47	1 74
Stationery	49,801 46	50,844 39	1.18	1.32
Telegraph	50,242 17	52,554 25	1.19	1.36
Taxes	164,321 09	177,815 55	3.90	4.60
Car mileage	243,078 42	256,587 67	5.76	6.63
Rents	.....	42,624 58	..	1.10
Miscellaneous	92,189 96	89,409 88	2.18	2.31
Totals	$4,219,955 14	$3,862,813 58	100.00	100,00

The locomotive expenses per mile run were 22.54 cents in 1874–75, against 25.14 in 1873–74. The saving is chiefly in fuel.

The Wear of Rails.

In the discussion of a report on the wear of rails, presented at the recent meeting of the American Society of Civil Engineers, Mr. A. L. Holley gave the following interesting facts as the result of his extensive observation and experience:

Rails with very thin flanges are advocated by the committee. Flanges 3-16 at the edge are used, and one-eighth inch is said to be sufficient to meet all engineering requirements. Now, there are metallurgical as well as engineering requirements, and on this subject, in default of more facts, I shall confine myself to a theoretical statement, supported by analogy, simply for the purpose of showing railway managers that there is enough in these metallurgical considerations to warrant further attention and research.

It will be admitted that the head of a rail, both as a support and bearing for wheels, and as the top chord of a girder, to resist compression, should be hard, while the base, to resist tensional strain, should be tough—and to be tough, it must be comparatively soft. As both hardness and softness are required, a homogeneous rail must possess a compromise between these two qualities. Many of the early steel rails wore much longer than those of modern temper, but the very hardness which increased their wearing decreased their toughness, and allowed them to break. After a vast amount of observation and experimenting, we have at last settled on 0.35 to 0.40 carbon, with the usual average of other hardening elements, as a compromise, and the complaint—true if not just—now is, that rails do not wear as well as the old brittle ones did.

Now, rails are always expected to be tough and fibrous in the flange, and may be weak and brittle in the head, if they are only hard. Nicking the flanges of steel rails is generally abandoned, and rails having any perceptible imperfection on the flange are thrown out, and thus it appears that the chief feature in the manufacture and treatment of rails is increasing and insuring the strength of the flange, even when it is done at the expense of reducing the wearing qualities of the head.

Now, what shall we say of an exactly opposite course? What shall we say of a specification for rails which increases the brittleness of the flange without helping the wearing qualities of the head? My theoretical charge against the advocates of excessively thin flanges is that they do this very thing.

When a steel rail with such flanges is rolled, however fast, even at the rate of fifteen passes in a minute and a half, the flange will come out of the last pass at a dark cherry red, while the head is of a reddish yellow. Now, if we know anything about steel, we know that rolling or hammering a dark cherry red heat tends to combine the graphitic carbon, and to that extent to make the steel hard and brittle. This is so true and so well understood that no steel-plate maker would put unannealed boiler plates in the market, and no boiler maker would be allowed to use unannealed plates if they contained as much carbon as 0.15. Annealing makes the carbon graphitic, removes strains and softens the steel. Now, the plate is finished hotter, if anything, than the flanges of the rail; it is all finished at the same heat; it has less than half as much carbon as rail steel has; it is not subject to impact in use, and yet must be softened. But the rail flange, which is much more likely to break, both from its temper and its treatment, should be made of such a form we are told that it must inevitably be hardened in finishing, and go into use with all its imperfections not on its head but in its foot. Perhaps there is some special Providence which excludes rails from the general laws which govern the behavior of steel in other forms. If so, it is important to know it on some more scientific ground than the fact that a great many thin-flanged steel rails have not as yet broken. Now, I do not attempt to state positively that the temperature at which the flange finishes has anything to do with the strength of the rail. Perhaps it is true, as stated squarely by the committee, that a rail generally breaks, not from weakness of the base, but from injury to the head. My chief object at this time is to ask railway engineers whether or not this subject is worthy of further consideration and experimenting; and if so, what tests will be satisfactory.

The subject is a difficult one. Two rails with different thickness of flange and otherwise alike, cannot be fairly compared, because their weight and the position of the neutral axis are not the same. Two other methods occur to me. One to anneal a number of thin flanged rails, and to subject these and a similar number of unannealed rails to physical tests. This might not be deemed satisfactory, as the whole of the unannealed rail would be toughened, and its resistance to wear would be decreased. The other method is to stop a number of thin flanged rails before the last pass in the rolls, and to stop another lot before the last two passes, and, perhaps, pursue the course further. These rails thus stopped off are to be reheated to as nearly as possible the color the head had when it was last in the rolls and then to receive the last pass or passes. The flanges and heads would thus be finished at substantially the same temperature. A large number of tests of these and ordinary rails from the same casts of steel would, perhaps, not give the exact difference in strength, but if there was an obvious and marked difference in their toughness, the general question of extremely thin flanges would be settled.

If there is anything in the theory, I will call it, that strength is decreased by the comparatively cold rolling of thin flanges, then the designers of flanges have in their hands one element of wearing, as well as of the other qualities of rails; for the amount of carbon the foot may have determines that which the head must not exceed. If the carbon in the foot is in such combination as to give more than the minimum degree of brittleness, then very little carbon can be put in; but if it is a condition to interfere in the least possible degree with toughness, then more may be put in, and so increase the wearing qualities of the head.

It is most desirable to have the profession decide whether or not these or any tests of this matter will be satisfactory before such tests are made. It would be unwise to go to the expense of a properly large number of such experiments and then to have the engineers say they were not conclusive. I have no doubt that ways and means can be soon provided to settle this most important and most unsettled question, if the profession will decide what tests will be satisfactory.

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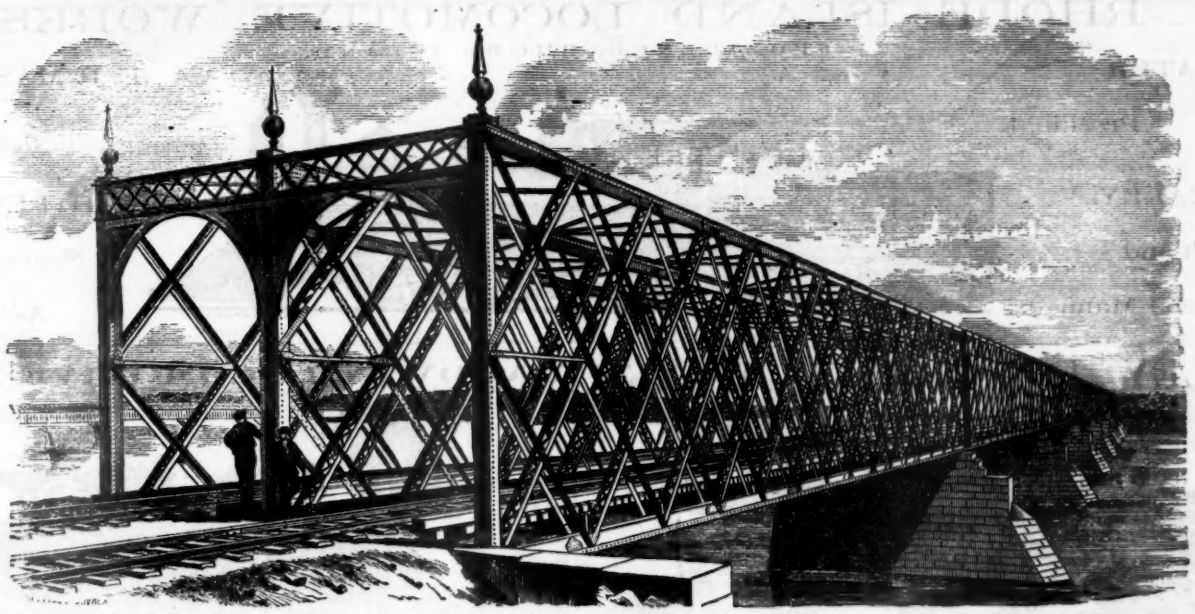

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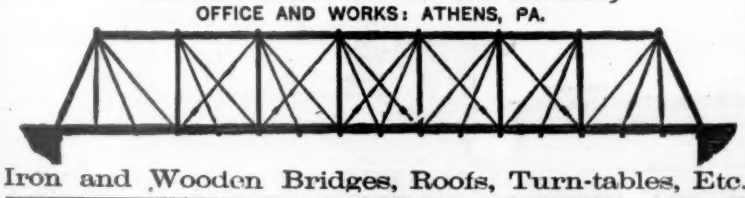

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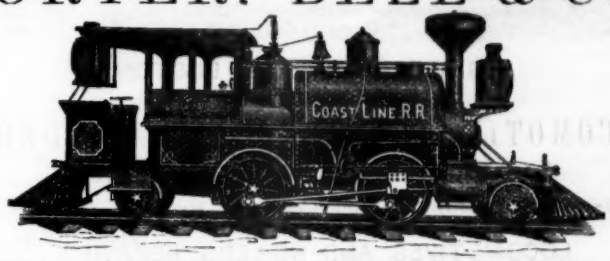

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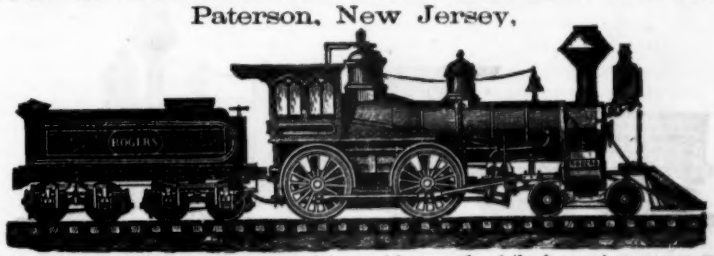

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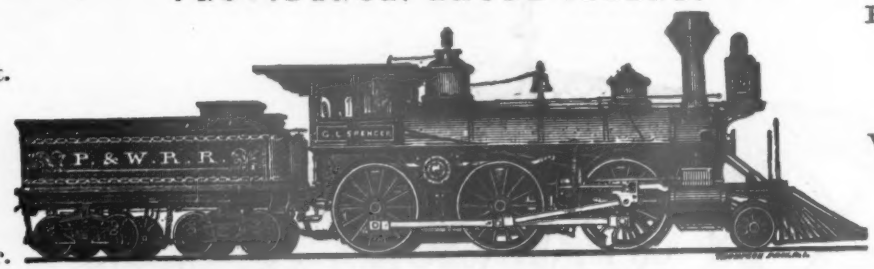

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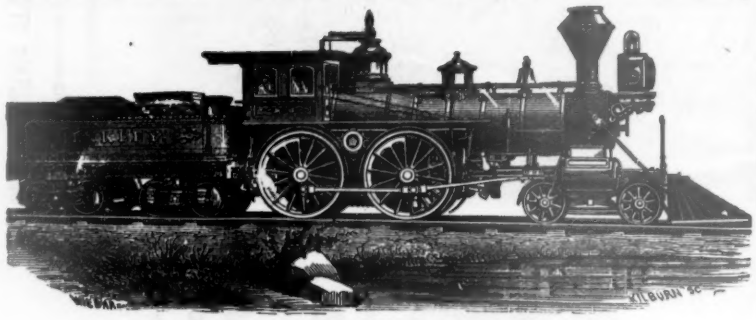

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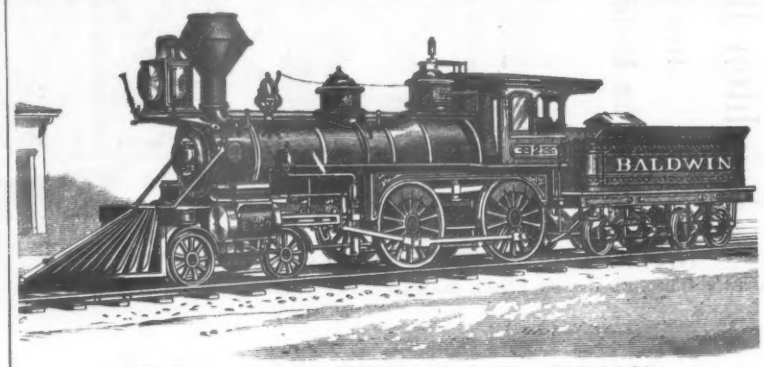

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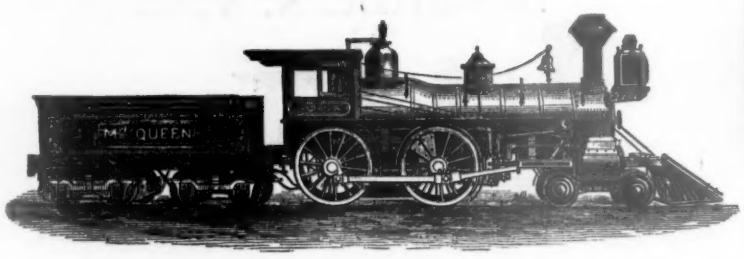

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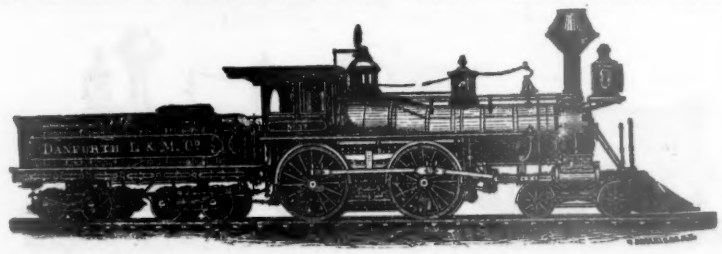

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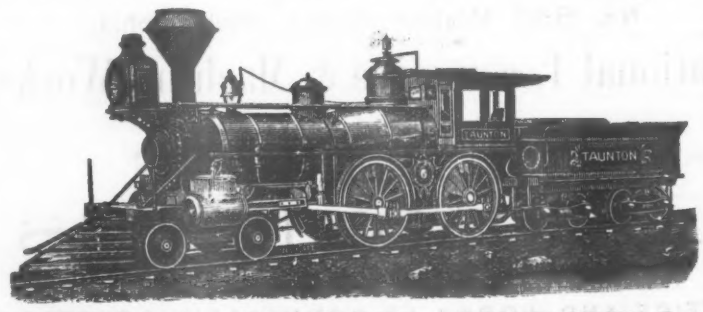

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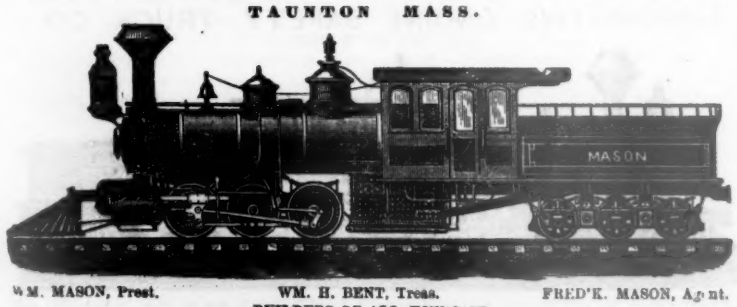

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